NORTHERN STATES POWER COMPANY
APPLICATION TO THE MINNESOTA PUBLIC UTILITIES COMMISSION FOR A ROUTE PERMIT

ORONO SUBSTATION REPLACEMENT And NEW 115KV TRANSMISSION LINE PROJECT

Alternative Permitting Process
MPUC Docket No. E002/TL-11-223

June 7, 2011

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1.0 EXECUTIVE SUMMARY

1.1 Proposal Summary

Northern States Power Company, a Minnesota corporation ("Xcel Energy" or the "Company") submits this application ("Application") for a Route Permit to the Minnesota Public Utilities Commission ("Commission" or "MPUC") pursuant to Minnesota Statutes Section 216E and Minnesota Rules Chapter 7850.

A Route Permit is requested to replace the existing Xcel Energy Orono Substation with a new 115 kV substation, construct approximately 2,041 feet of new double circuit 115 kilovolt ("kV") transmission line and construct approximately 1,095 feet of single circuit 115 kV transmission line within the municipal boundaries of the City of Orono located west of the Twin Cities metropolitan area, Hennepin County, Minnesota (the "Project"). **Figure 1** shows the general vicinity of the proposed Project.

The substation replacement will include a complete rebuild of the existing Orono Substation from an existing operating voltage of 69 kV to an operating voltage of 115 kV. The increase in the operating voltage of the existing Orono Substation is needed to improve local and system reliability, reduce the risk of overloads, and allow for additional load growth in the future.

The Project qualifies for the Alternative Permitting Process under Minn. Stat. § 216E.04, subd. 2(3), and Minn. Rules Chapter 7850.2800 to 7850.3900 (*see* Minn. R. 7850.2800, Subp. 1(C)). The Company respectfully requests that the Commission approve the proposed route and authorize a 400-foot route width along the proposed route.

Figure 1
Project Location

1.2 Completeness Checklist

The content requirements for an application with the Commission under the Alternative Permitting Process are identified under Minn. Stat. § 216E.04, subd. 2(3) and Minn. R. 7850.2900 and 7850.1700. **Table 1** lists the rule requirements and the section where the information can be found in this Application.

Table 1
Completeness Checklist

Authority	Required Information	Where
Minn. R. 7850.2800, Subp. 1(C)	**Subpart 1. Eligible Projects**	
	An applicant for a site permit or a route permit for one of the following projects may elect to follow the procedures of parts 7850.2800 to 7850.3900 instead of the full permitting procedures in part 7850.1700 to 7850.2700 for high voltage transmission lines of between 100 and 200 kilovolts.	2.5
Minn. R. 7850.2800 Subp. 2	**Subpart 2. Notice to Commission**	
	An applicant for a permit for one of the qualifying projects in subpart 1, who intends to follow the procedures of parts 7850.2800 to 7850.3700, shall notify the Commission of such intent, in writing, at least 10 days before submitting an application for the projects.	2.6 and Appendix A
Minn. R. 7850.3100	**Contents of Application (alternative permitting process)**	
	The applicant shall include in the application the same information required in part 7850.1900, except the applicant need not propose any alternative sites or routes to the preferred site or route. If the applicant has rejected alternative sites or routes, the applicant shall include in the application the identity of the rejected sites or routes and an explanation of the reasons for rejecting them.	4.3
Minn. R. 7850.1900, Subp. 2 (applicable per Minn. R. 7850.3100)	**Route Permit for HVTL**	
A.	a statement of proposed ownership of the facility at the time of filing the application and after commercial operation	2.1
B.	the precise name of any person or organization to be initially named as permittee or permittees and the name of any other person to whom the permit may be transferred if transfer of the permit is contemplated	2.3

Authority	Required Information	Where
C.	at least two proposed routes for the proposed high voltage transmission line and identification of the applicant's preferred route and the reasons for the preference	Not Applicable per Minn. R. 7850.3100. However see 4.3
D.	a description of the proposed high voltage transmission line and all associated facilities including the size and type of the high voltage transmission line	3.2, 4.1, 4.4, 5.1.1
E.	the environmental information required under 7850.1900, Subp. 3	Chapter 6
F.	identification of land uses and environmental conditions along the proposed routes	Chapter 6
G.	the names of each owner whose property is within any of the proposed routes for the high voltage transmission line	8.2 and Appendix D.1
H.	United States Geological Survey topographical maps or other maps acceptable to the chair showing the entire length of the high voltage transmission line on all proposed routes	Appendix B
I.	identification of existing utility and public rights-of-way along or parallel to the proposed routes that have the potential to share right-of-way, the land used by a public utility (as for a transmission line), with the proposed line	4.1, 4.2, 4.3, 5.1.2
J.	the engineering and operational design concepts for the proposed high voltage transmission line, including information on the electric and magnetic fields of the transmission line	5.0, 5.2
K.	cost analysis of each route, including the costs of constructing, operating, and maintaining the high voltage transmission line that are dependent on design and route	3.5
L.	a description of possible design options to accommodate expansion of the high voltage transmission line in the future	4.5
M.	the procedures and practices proposed for the acquisition and restoration of the right-of-way, construction, and maintenance of the high voltage transmission line	5.1.3 – 5.1.6
N.	a listing and brief description of federal, state, and local permits that may be required for the proposed high voltage transmission line	8.4
O.	a copy of the Certificate of Need or the certified HVTL list containing the proposed high voltage transmission line or documentation that an application for a Certificate of Need has been submitted or is not required	2.4
Minn. R. 7850.1900, Subp. 3	**Environmental Information**	
A.	a description of the environmental setting for each site or route	6.1
B.	a description of the effects of construction and operation of the facility on human settlement, including, but not limited to, public health and safety, displacement, noise, aesthetics, socioeconomic impacts, cultural values, recreation, and public services	6.2

Authority	Required Information	Where
C.	a description of the effects of the facility on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining	6.3
D.	a description of the effects of the facility on archaeological and historic resources	6.4
E.	a description of the effects of the facility on the natural environment, including effects on air and water quality resources and flora and fauna	6.5
F.	a description of the effects of the facility on rare and unique natural resources	6.6
G.	identification of human and natural environmental effects that cannot be avoided if the facility is approved at a specific site or route	Chapter 6.0
H.	a description of measures that might be implemented to mitigate the potential human and environmental impacts identified in items A to G and the estimated costs of such mitigative measures	Chapter 6.0

2.0 INTRODUCTION

2.1 Statement of Ownership

Xcel Energy will construct, own, and operate the proposed new 115 kV transmission line and new 115 kV Orono Substation. The new transmission line will connect the expanded Orono Substation to an existing 115 kV transmission line (Line 0831) located approximately 2,600 feet northwest of the Orono Substation site. The address of the Orono Substation is 3960 Sixth Avenue North, City of Orono ("City"), Hennepin County, Minnesota. *See* **Figure 2**.

Xcel Energy is a Minnesota corporation with its headquarters in Minneapolis, Minnesota. Xcel Energy is a wholly owned subsidiary of Xcel Energy Inc., a utility holding company with its headquarters in Minneapolis. Xcel Energy provides electricity services to approximately 1.2 million customers and natural gas services to 435,000 residential, commercial, and industrial customers in Minnesota. Xcel Energy also provides electricity service to more than 83,000 customers in South Dakota and 88,000 customers in North Dakota.

Xcel Energy Services Inc. is the service company for Xcel Energy Inc. holding company system and its personnel prepare, submit, and administer regulatory applications to the Commission on behalf of Xcel Energy, including Route Permit applications.

2.2 Requested Action

This Application is submitted under the Alternative Permitting Process under Minn. Stat. § 216E.04, subd. 2(3) and Minn. R. 7850.2800 to 7850.3900 (*see* Minn. R. 7850.2800, Subp. 1(C)). While the rules do not require consideration of alternative routes in the Application (*see* Minn. Rules Chapter 7850.3100), Xcel Energy's evaluation of four alternative routes, in addition to the "Proposed Route", as herein described for the Project is contained in this Application. *See* Figure 2. For the reasons presented herein, Xcel Energy prefers the Proposed Route for the new transmission line and substation replacement, and respectfully requests that the Commission approves the Proposed Route and authorize a route width of 200 feet on each side of the route centerline along the Proposed Route (400 feet total width).

This Application demonstrates that construction of the Project at the existing Orono Substation and along the Proposed Route will comply with the applicable standards and criteria set out in Minn. Stat. § 216E.03, subd. 7, and Minn. R. 7850.4100. The Project will support the State's goals to conserve resources, minimize environmental and human settlement impacts and land use conflicts, and ensure the State's electric energy security through the construction of efficient, cost-effective transmission infrastructure.

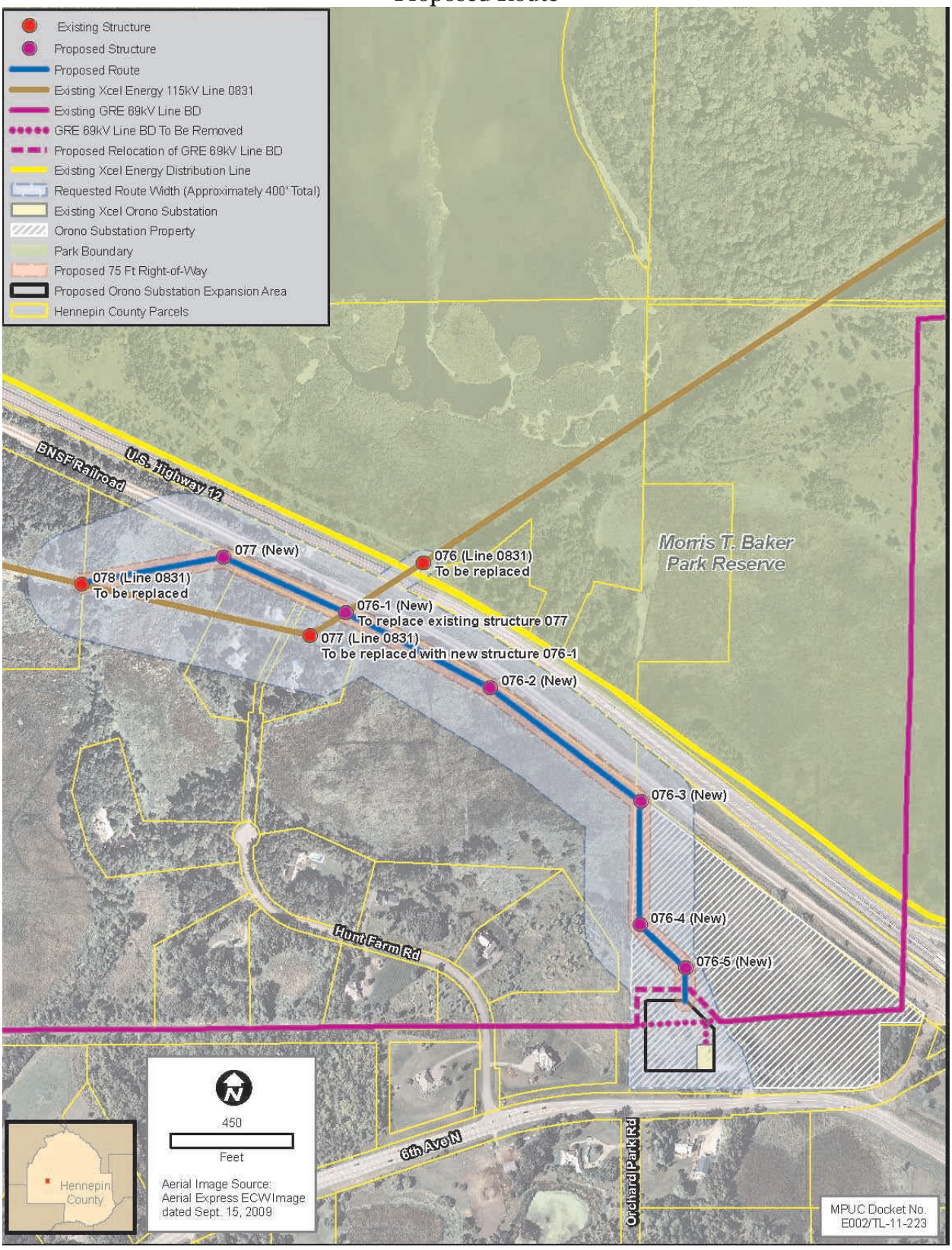
2.3 Permittee

The permittee for the proposed Project is:

Permittee: Northern States Power Company, a Minnesota Corporation
Contact: Joseph G. Sedarski
Senior Permitting Analyst, Siting and Land Rights

Address: Xcel Energy Services Inc.
414 Nicollet Mall, MP-8
Minneapolis, MN 55401
Phone: 612-330-6435
Email: joseph.g.sedarski@xcelenergy.com

Figure 2
Proposed Route



2.4 Certificate of Need

A Certificate of Need ("CON") is not required for the Project because it is not classified as a large energy facility under Minn. Stat. §§ 216B.243 and 216B.2421, subd. 2(3). While the Project is a HVTL with a capacity of 100 kV or more, it is not more than 10 miles long in Minnesota and it does not cross a state line. Therefore, a CON is not required. *See* Minn. Stat. §§ 216B.2421, subd. 2(3) and 216B.243.

2.5 Route Permit, Alternative Permitting Process

The Minnesota Power Plant Siting Act ("PPSA") provides that no person may construct a HVTL without a Route Permit from the Commission. Minn. Stat. § 216E.03, subd. 2. Under the PPSA, an HVTL includes a transmission line that is 100 kV or more and is greater than 1,500 feet in length. Minn. Stat. § 216E.01, subd. 4. The proposed new 115 kV transmission line is an HVTL greater than 1,500 feet in length and, therefore, a Route Permit is required from the Commission prior to construction. The Project qualifies for review under the Alternative Permitting Process authorized by Minn. Stat. § 216E.04, subd. 2(3), and Minn. R. 7850.2800, Subp. 1(C) (establishing alternative process for HVTLs between 100 and 200 kilovolts). Accordingly, Xcel Energy is following the provisions of the Alternative Permitting Process outlined in Minn. R. 7850.2800 to 7850.3900 for this Project.

2.6 Notice to Commission

Xcel Energy notified the Commission on March 17, 2011, by letter (mailed and electronically filed) that Xcel Energy intended to use the Alternative Permitting Process for the Project. This letter complies with the requirement of Minn. R. 7850.2800, Subp. 2, to notify the Commission of this election at least 10 days prior to submitting an application for a Route Permit. A copy of the letter is attached in **Appendix A**.

3.0 PROJECT INFORMATION

3.1 Project Location

The proposed Project is located within Hennepin County, Minnesota. **Figure 1** shows an overview of the general vicinity of the Project and the Proposed Route is shown in **Figure 2**. **Appendix B** includes detailed maps of the proposed Project and the planned replacement of the existing Orono Substation described in this Application. The Project is located wholly within the municipal boundaries of the City of Orono within Township 118N, Range 23W, Sections 29, 30 and 32.

3.2 Project Proposal

Xcel Energy proposes to replace the existing 69 kV Orono Substation with a new 115-13.8 kV transmission substation and connect the new substation to existing Xcel Energy 115 kV transmission Line 0831 by constructing a new double circuit 115 kV transmission line.

The proposed new 115 kV double circuit transmission line primarily runs north and west from the Orono Substation site to transmission Line 0831. **Figure 2** and **Figure B-2** in **Appendix B** show the Proposed Route. **Appendix B** also includes detailed maps concerning environmental factors of the proposed Project.

More specifically, Xcel Energy proposes the following for the Project:

- install approximately 2,041 feet of new double circuit 115 kV transmission line and structures from the new Orono Substation to the connection point with existing 115 kV transmission Line 0831 at new transmission Structure 076-1;

- remove three existing transmission structures (Structures 076, 077, and 078) and associated 1,030 feet of single circuit 115 kV transmission Line 0831 and installing two new structures and approximately 1,095 feet of single circuit 115 kV transmission line to re-route the existing line off of residential property and onto adjacent Huntington Farm Association ("HFA")[1] property adjacent to the BNSF railroad;

- disconnect the existing Line 0831 at transmission Structure 077, install a new double circuit corner structure, and connect the new double circuit 115 kV transmission line from the new Orono Substation to Line 0831;

- installing fiber optic ground wire with the new 115 kV transmission line and the replaced segment of Line 0831;

- except for existing switchgear (which will be reused in the new substation), remove the existing Orono Substation and construct the replacement Orono Substation as a 115-13.8 kV transmission substation to accommodate the new 115 kV line termination and/or ring bus by, installing a 28 MVA, 118-14.3 kV transformer, adding transfer trip

[1] HFA is an association of landowners which are a part of the Huntington Farm residential development that is located west of the existing Orono Substation site. HFA owns undeveloped parcels surrounding the residential parcels that are part of HFA.

and pilot relaying, installing fiber optic lines for relaying and transfer trip, installing breakers, reconfiguring line protection, replacing shield wire with fiber optic shield wire, and related modifications; and

- revise as needed line designations, terminals, breakers, relays, and line protection as a result of the above changes in connecting the new Orono Substation to 115 kV transmission Line 0831.

Specific details to the substation replacement and associated facilities are further described in Section 4.4. While not part of the Route Permit requested by Xcel Energy, the following work will also be completed:

- disconnect approximately 385 feet of existing Great River Energy (GRE) 69 kV transmission line (BD) from the existing Orono Substation and re-route approximately 420 feet of this line around the proposed new Orono Substation and associated new 115 kV transmission line facilities (the re-routed GRE 69 kV transmission line would not be connected to the new Orono Substation).

The proposed transmission structures are single-pole, galvanized steel or weathering-steel type structures. The height of the new single circuit poles will range from 70 to 90 feet while the double circuit poles will range from 75 to 115 feet, with the spans between poles ranging from 300 to 500 feet. Xcel Energy respectfully requests a route width of up to 200 feet on each side of the Proposed Route alignment (400 feet total width), on either side of Line 0831 to Structure 076 and up to the south side of U.S. Highway 12 (*see* **Figure 2**). Following construction, the typical right-of-way width for the new transmission line will be 75 feet.

3.3 Need for Project

The Project, which includes increasing the operating voltage of the existing Orono Substation from 69 kV to 115 kV and connecting it to Xcel Energy's existing transmission system, is needed to improve local and system reliability, reduce the risk of overloads, and allow for additional load growth in the future (*Hollydale/Meadow Lake Load Serving Study,* Xcel Energy Services, Transmission System Planning and Reliability Assessment, June 2011).

3.4 Project Schedule

Construction for the Project is expected to begin in the first quarter 2012, and Xcel Energy anticipates a second quarter 2013 in-service date for the proposed facilities. **Table 2** provides an estimated permitting and construction schedule summary.

Table 2
Estimated Project Schedule

Project Task	Date
File Route Permit Application with the Commission	2nd Quarter 2011
Route Permit Review Process Complete	4th Quarter 2011
Begin Transmission Line and Substation Construction	1st Quarter 2012
In-Service Date	2nd Quarter 2013

This Project schedule is based on information known as of the date of this filing and upon planning assumptions that balance the timing of implementation with the availability of crews and materials and with other practical considerations. This schedule may be subject to revision as further information is developed.

3.5 Project Cost

Xcel Energy estimates that the Proposed new transmission line and new Orono Substation will cost approximately $5.3 million, depending upon the selected route, and broken down as follows in **Table 3**.

Table 3
Estimated Project Cost

Project Item	Cost
New 115 kV Transmission Line Facilities along Proposed Route	$1.2 million
Orono Substation Removal and Replacement	$4.1 million
Total Project Cost	$5.3 million

Xcel Energy will construct, operate and maintain the new Orono Substation and transmission lines proposed in this Project.

Operating and maintenance costs for the transmission line will be nominal for several years, since the line will be new and minimal vegetation maintenance will be required. Typical annual operating and maintenance costs for 115 kV transmission voltages across Xcel Energy's Upper Midwest system area are on the order of $300 to $500 per mile of transmission right-of-way. The principal operating and maintenance cost include inspections, which are usually done by fixed-wing aircraft and by helicopter on a regular basis.

The Company performs periodic inspections of substations and equipment. The type and frequency of inspection varies depending on the type of equipment. Typical inspection intervals are semi-annual or annual. Maintenance and repairs are performed on an as-needed basis, and therefore the cost varies from substation to substation.

4.0 FACILITY DESCRIPTION AND ROUTE SELECTION RATIONALE

4.1 Transmission Line Description

The Project involves replacing the existing 69-13.8 kV Orono Substation (a distribution substation) with a 115-13.8 kV transmission substation and constructing approximately 1,095 feet of single circuit and approximately 2,041 feet of double circuit 115 kV overhead transmission line. The proposed transmission line will originate at the proposed new Orono Substation. *See* **Figure 2**.

At the point the Proposed Route exits the planned substation replacement area, it extends approximately 866 feet northwesterly and north within the 16-acre substation site and along Xcel Energy's western property line to south of the BNSF railroad right-of-way. At this point the Proposed Route extends westerly across HFA property and paralleling the BNSF railroad right-of-way approximately 1,205 feet where it will connect to a new transmission structure (to be designated Structure 076-1) that will replace existing Structure 077 on Line 0831. Existing Structure 077 will be removed from its current location on private residential property and moved to a new location on HFA property. *See* **Figure 2**.

From this point, the Proposed Route continues approximately 590 feet northwesterly and parallel to the BNSF railroad right-of-way across HFA land to a new transmission structure (to be called Structure 077). The Proposed Route then bears southwesterly across HFA land, a water crossing and a wetland to existing Structure 078 where it will terminate. Transmission Structure 078 will be replaced with a new structure, but it will continue to be called Structure 078 on Line 0831. *See* **Figure 2**.

After exiting Xcel Energy property, the Proposed Route for the transmission line crosses undeveloped land within the HFA for approximately 2,270 feet. Under the City of Orono Zoning Regulations, HFA land is designation "Outlot A" Common Area and is Zoned PRD (Planned Residential Development). The Proposed Route will only traverse approximately 2,270 feet of HFA land and will primarily parallel the existing BNSF right-of-way before terminating at existing Xcel Energy transmission Structure 078. A detailed description of the Proposed Route is provided in **Table 4**. **Figure 2** provides an overview of the Proposed Route and **Appendix B, Figure B-2** provides an additional detailed map of the proposed Project.

The entire proposed new 115 kV transmission line will be constructed with single-pole, galvanized steel or weathering-steel structures with davit arms or braced posts on drilled pier foundations. The Project's proposed transmission line will create a loop connecting the new Orono Substation and Xcel Energy's Gleason Lake and Crow River Substations via transmission Line 0831. The Gleason Lake Substation is located approximately 6.1 miles east of the Orono Substation, and the Crow River Substation is located approximately 9.5 miles northwest of the Orono Substation.

The Proposed Route is within or adjacent to the existing rights-of-way of highways, railroads and Xcel Energy property for approximately 2,661 feet of the length of the route or 84 percent. The remaining 475 feet of the route crosses an undeveloped area of HFA property. Overall the Project crosses Xcel Energy property and undeveloped HFA land for 100 percent of the Proposed Route.

Table 4
Detailed Description of Proposed Route

Proposed Route	Distance	Road and Public Waters Crossing
Orono Substation to existing Xcel Energy 115 kV Line 0831 south of U.S. Highway 12 (2,600 feet west of Orono Substation)		
North out of proposed new substation on Xcel Energy property (double circuit on proposed Structure 076-4))	100 feet	No features crossed
Northwest to Xcel Energy's west property line (double circuit on proposed Structures 076-4 and 076-3)	311 feet	No features crossed
North along Xcel Energy's west property line to just south of BNSF right-of-way (double circuit on proposed Structures 076-3 to 076-2)	455 feet	Unnamed Wetland
Northwest across HFA land and paralleling BNSF right-of-way to proposed Structure 076-1 (double circuit on proposed Structures 076-2 and 076-1)	1,205 feet	Unnamed Wetland
Northwest paralleling BNSF right-of-way (single circuit on proposed Structures 076-1 and new 077)	590 feet	Painter Creek
Southwest (single circuit on proposed new Structures 077 and 078)	475 feet	Unnamed Wetland
Total Length	**3,136 feet**	

There are no residences located within 200 feet of the Proposed Route centerline (*see* Section 6.2.2). A total of 34 cultural resource sites are located within one mile of the Proposed Route, including 15 archaeological sites and 19 historic architectural properties. None of the 15 archaeological sites are listed on the National Register Considered Eligible Finding ("CEF"). Of the 19 architectural properties, none listed or eligible for listing on the National Register of Historic Places ("NRHP") (see Section 6.4). The historic character of the architectural properties will not be affected by the Proposed Route nor does the Proposed Route cross any of the 15 archaeological sites. The Proposed Route does cross any three Public Waters Inventory ("PWI") watercourses or waterbodies. Of the PWIs crossed, Painter Creek will be crossed by the Proposed Route just prior to or after proposed the connection to Structure 077 depending on final placement of this Structure. The Proposed Route will also cross two PWI wetlands (Unnamed (27-917-W and 27-916-W). These two wetlands appear to have been connected prior to the development of the HFA properties. The Proposed Route will span approximately 2,135 feet of wetland (see Section 6.5.4).

4.2 Route Width and Alignment Selection Process

4.2.1 Route Width

The PPSA, Minn. Stat. Chapter 216E, directs the Commission to locate transmission lines in a manner that "minimize[s] adverse human and environmental impact while ensuring continuing electric power system reliability and integrity and ensuring their electric needs are met and fulfilled in

an orderly and timely fashion." Minn. Stat. § 216E.02, subd. 1. The PPSA also authorizes the Commission to meet its routing responsibility by designating a "route" for a new transmission line when it issues a Route Permit. The route may have "a variable width of up to 1.25 miles" within which the right-of-way for the facilities can be located. Minn. Stat. § 216E.01, subd. 8.

Based upon the following analysis, Xcel Energy respectfully requests that the Commission authorize a route width of 200 feet on each side of the route alignment on either side of Line 0831 to Structure 076 and up to the south side of U.S. Highway 12, for a total route width of up to 400 feet (*see* **Figure 2**) for the routes proposed in the Application. A detailed map showing currently planned route widths and proposed alignments is provided in **Appendix B, Figure B-2**.

4.2.2 Route Selection Process

In developing the route proposed in this Application, Xcel Energy first analyzed the statutory and rule criteria set forth in the PPSA, Minn. Stat. Chapter 216E, and Minn. R. 7850.4100. Xcel Energy also gave due consideration to non-proliferation of new infrastructure corridors and met with interested stakeholders and landowners, including applicable municipalities and government agencies. Throughout the process, Xcel Energy evaluated several route alternatives, considering feedback provided at City of Orono ("City") planning meetings and through written comments. Xcel Energy also consulted with federal, state, and local agencies associated with the general vicinity of the Project.

Xcel Energy initially sought local review of the proposed Project from the City. On September 1, 2010, the Company notified the Commission of its intent to follow the local review process for the Project (*see* **Appendix C, C.3**). The Commission, through the Minnesota Department of Commerce, Office of Energy Security, acknowledged the Company notice in a letter dated September 10, 2010 (*see* **Appendix C, C.10,** Docket No. E002/LR-10-957).

On August 20, 2010, Xcel Energy submitted a Conditional Use Permit ("CUP") to the City, the Local Government Unit ("LGU"). See Section 8.1.1 and **Appendix C** of this Application for additional information. On September 20, 2010 the City Planning Commission met to discuss the Project, review Environmental Assessment ("EA") requirements for the Project, and request public comment on the scope of the EA. Public interest focused primarily on the proposed location of the new 115 kV transmission line within and near HFA and residential properties near the Orono Substation site, impacts to land values, aesthetics and health concerns.

On December 13, 2010, the Orono City Council voted to refer review and permitting of the routing and siting of the Project to the Commission pursuant to Minn. Stat. 216E.05, subd. 1(b), and Minn. Rule 7850.5300 subp. 4 (*see* **Appendix C, C.3**). Xcel Energy then initiated the State permitting process for the Project.

The Proposed Route was subsequently developed by Xcel Energy's permitting and engineering personnel based on their investigation of the overall area in the vicinity of the Project and on input from the public and government agencies. The general vicinity around the Project was initially studied during the planning process by a team of siting, right-of-way, planning, environmental, ecological, and engineering personnel. The team also reviewed the general area surrounding the Project to help identify anticipated and significant routing issues that might arise.

The Company also performed an analysis of environmental resources in the Project Area by using computer mapping aerial photographs, topographic maps and ground reconnaissance. Environmental resources identified within the general vicinity of the Project are discussed in Sections 6.5 and 6.6 of this Application. The Proposed Route is designed to best minimize the overall impacts of the Project.

The proposed location of transmission line locations and associated structures and facilities were developed with the following primary objectives:

- Maximize use of existing Xcel Energy property;
- Minimize land use impacts by routing along transportation corridors and existing distribution and transmission lines to reduce the amount of new right-of-way required;
- Minimize land use impacts by routing along natural corridors, field lines, and property lines, where an existing corridor (e.g., fence line, drainage ditch, access road) is present;
- Minimize use of new right-of-way;
- Minimize impacts to residences;
- Minimize impacts to public resources, including Baker Park Reserve; and
- Minimize impacts to environmental and sensitive resources.

The Company believes the Proposed Route and use of the existing 16-acre Xcel Energy property best meets the objectives stated above. The Proposed Route is within or adjacent to the existing rights-of-way of highways, railroads and Xcel Energy property for approximately 2,661 feet of the length of the route or 84 percent. The remaining 475 feet of the route crosses an undeveloped area of HFA property. Together, the Proposed Route is within the 16-acre Xcel Energy property and undeveloped HFA land for 100 percent of the route. The Proposed Route does not cross any public roads, trails or railways.

The Proposed Route requires some clearing of trees and vegetation. The clearing of trees and vegetation is required where the existing 115 kV transmission Line 0831 crosses two residential lots that are associated with the HFA. During the route investigation phase of the Project, Xcel Energy met with these two landowners and began discussing an option to remove the existing 115 kV transmission Line 0831 and associated structures located at their properties and to relocate them with a new line and structures north and on adjacent HFA property (see **Figure B-2** in **Appendix B**). While removing the existing transmission facilities from residential parcels will minimize impacts to these residents and no longer require clearing of trees and vegetation at these parcels, it will increase the overall length of new transmission line for the Project (approximately 885 feet of additional line), add additional support structures and require some additional right-of-way clearing. The use of existing transmission line corridors, existing railroad corridor, and Xcel Energy's own property was an important factor for this Project because using existing corridors reduces transmission line proliferation and minimizes and reduces impacts to residences and environmental and sensitive resources.

4.3 Alternative Routes Considered and Rejected

In consultation with surrounding landowners, the City and applicable regulatory agencies, Xcel Energy identified and analyzed four Alternative Routes for the Project, which are identified as "Alternative Route 1", "Alternative Route 2", "Alternative Route 3" and "Alternative Route 4" (collectively, "Alternative Routes") in **Appendix G, Figure G-1**, and are further described in **Appendix G**. **Table G.1** in **Appendix G** provides a detailed description of the Alternative Routes, including road and waterbody crossings.

In evaluating the Alternative Routes, Xcel Energy focused predominantly on the location of existing transportation corridors, alignment of the existing distribution and transmission lines and land use because they best satisfy the routing criteria. The Alternative Routes follow existing rights-of-way and property lines to the extent feasible.

In performing the Alternative Routes analysis, Xcel Energy considered social, environmental, and engineering-related factors, such as location of existing transportation and utility corridors, land use, site conditions, proximity to residential or commercial structures, environmental impacts, effects on trees, proximity to areas of archaeological or historical significance, proximity to wetlands or PWI watercourses, and several engineering design-related factors. Based on this analysis, Xcel Energy concluded that the Alternative Routes were not preferable to the Proposed Route for the reasons summarized below and further described in **Appendix G**.

4.3.1 Alternative Route 1

Alternative Route 1 and the Proposed Route share the same route for the first 1,701 feet of the Proposed Route. At this point Alternative Route 1 deviates from the Proposed Route on a more westerly course for approximately 550 feet to existing Structure 077 of Line 0831.

Alternative Route 1 is not preferable to the Proposed Route because it will not fulfill one main objective of the Project, that being to minimize impacts to residences. As discussed in Section 4.2.2, Xcel Energy is working with the two landowners whose properties are currently crossed by existing Line 0831 to remove the Line 0831 from the properties and move the line north of their respective property lines onto adjacent HFA property. Alternative Route 1 also requires the clearing of some mature trees through the middle of one of the residential lots for right-of-way purposes.

4.3.2 Alternative Route 2

Alternative Route 2 utilizes the portion of the Proposed Route (866 feet) prior to the Proposed Route turning westerly at the BNSF railroad right-of-way. At this point Alternative Route 2 continues north an approximate 326 feet and crosses the BNSF railroad, a Metropolitan Council sewer line, U.S. Highway 12 and an existing Xcel Energy distribution line. Upon exiting U.S. Highway 12 right-of-way, Alternative Route 2 enters the Three Rivers Park District's Baker Park Reserve. From here Alternative Route 2 continues westerly approximately 974 feet across Baker Park Reserve property connecting to existing Xcel Energy 115 kV transmission Line 0831 (*see* **Figure 3**). The existing tower (Structure 076) located at this connection point lies within 30 feet of a paved bike path within Baker Park Reserve.

Alternative Route 2 was rejected due to the number of transportation crossings (e.g. the BNSF railroad, U.S. Highway 12), the location of an existing Metropolitan Council sewer line located

between the railroad and highway and impact to Baker Park Reserve property. Alternative Route 2 is not preferable to the Proposed Route because it does not fulfill two main objectives of the Project, those being: i) maximizing the use of existing transportation rights-of-way and transmission line alignments; and ii) minimizing the impacts to Baker Park Reserve, when compared to the Proposed Route.

4.3.3 Alternative Route 3

Alternative Route 3 and the Proposed Route share the same route from the point the routes leave the proposed substation replacement to approximately 1,000 feet west of the point both routes turn westerly along the BNSF railroad right-of-way. At this location Alternative Route 3 extends both to the north and to the west to make connections with Xcel Energy's existing 115 kV transmission Line 0831. The northerly connection includes a 329 foot span across the BNSF railroad, the Metropolitan Council sewer line, U.S. Highway 12, and enters into Baker Park Reserve property making the northern connection to transmission Line 0831 at existing Structure 076. Similar to the Proposed Route, this northern connection would require that existing Structure 076 be replaced by a steel single pole. The westerly connection of Alternative Route 3, south of the BNSF railroad and U.S. Highway 12, spans across HFA land, and spans a residential lot for approximately 384 feet to connect to Xcel Energy's existing 115 kV transmission Line 0831 at Structure 077. The existing 115 kV line between the two connection points that spans the BNSF railroad, the Metropolitan Council sewer line and U.S. Highway 12 in Alternative Route 3 would be removed from service. However, a new span for the northern connection to Line 0831 would cross over the BNSF railroad, the Metropolitan Council sewer line and U.S. Highway 12.

Alternative Route 3 is not preferable to the Proposed Route because it does not fulfill one main objective of the Project, that being minimize to impacts to residences. As discussed in section 4.2.2 Xcel Energy is working with two residential landowners to remove the existing 115 kV transmission line from their residential lots within the HFA and move it north onto HFA land. Alternative Route 3 also requires the clearing of some mature trees through the middle of one of the residential lots for right-of-way purposes.

4.3.4 Alternative Route 4

Alternative Route 4 was evaluated for the potential to parallel the existing GRE 69 kV transmission Line BD right-of-way. Alternative Route 4 exits the proposed substation replacement area northeasterly for approximately 100 feet over Xcel Energy property before turning southeasterly for an additional approximate 160 feet. Alternative Route 4 then parallels the GRE Line BD for approximately 3,130 of the route. Alternative Route 4 would continue east for approximately 607 feet prior to turning north. Upon turning north Alternative Route 4 would continue to follow the GRE Line BD north for approximately 2,523 feet leaving Xcel Energy's property and crossing over the BNSF railroad, the Metropolitan Council sewer line, U.S. Highway 12 and entering Barker Park Reserve. At this point the GRE Line BD turns east. Alternative Route 4 would continue north for approximately 350 feet across the Baker Park Reserve requiring new right-of-way that would not be co-located with other utility rights-of-way. Alternative Route 4 is the longest of the four routes evaluated for the Project.

Alternative Route 4 is not preferable to the Proposed Route because it will not fulfill two main objectives of the Project, those being: i) minimizing impacts to environmental and sensitive resources; and ii) minimizing the impacts to Baker Park Reserve, when compared to the Proposed

Route. Additionally, Alternative Route 4 requires crossing the BNSF railroad, the Metropolitan Council sewer line and U.S. Highway 12 unlike the Proposed Route.

4.4 Associated Facilities and Substation Modifications

The associated facilities for the Project include a replacement of the existing 69 kV Orono Substation with a larger 115 kV substation, where the proposed new 115 kV transmission line will begin on the southeast end of the Project, reconfiguring Line 0831 and replacement of transmission Structures 076, 077 and 078. No additional fee land purchase is anticipated for the replacement of the existing Orono Substation.

4.4.1 Orono Substation (Replacement)

The existing Orono Substation is located at 3960 6th Avenue North, Orono, Hennepin County, Minnesota, on a 16-acre site owned by Xcel Energy, approximately 900 feet west of the intersection of U.S. Highway 12 and County Road 6. It is approximately one mile east of the City of Maple Plain municipal boundaries (*see* **Figure B-3** in **Appendix B**). The existing Orono Substation is a 69-13.8 kV distribution substation that will be partially demolished and replaced with a new 115-13.8 kV distribution substation (*see* **Appendix B, Figure B-10**). All of the substation replacement will be located within existing Xcel Energy property at the 16-acre site and will encompass the site of the existing 69 kV substation.

The existing switchgear will be reused in the proposed new substation. The existing substation will remain energized until the existing switchgear enclosure in its current location can be energized from the new 115 kV source. During construction a feeder field ties with ORO62 and a mobile substation with associated equipment will be installed to ensure continuity of service for the 17 MVA load before the switchgear enclosure is switched to the new 115 kV source.

On the transmission portion of the Orono Substation project, the proposed replacement consists of:

- a new 115-13.8 kV substation with a 28 mega volt ampere ("MVA"), 118-14.3 kV transformer;
- two 115 kV line terminations, each with a motor-operated transmission line switch with a quick-break line dropping whip;
- one single-phase coupling capacitors voltage transformers ("CCTVs") with carrier accessories;
- a 2000 amp ("A") wave trap with line tuner; and
- three 76 kV maximum continuous operating voltage ("MCOV") station class surge arresters.

The transmission portion of the replacement work also includes all bus (all 115 kV bus will be sized for a minimum 2000A capacity), cable, controls and relaying, steel, trenching, applicable setbacks, stormwater ponds, grading, foundations, fencing, new and existing rights-of-way for the transmission line and transmission line termination structures. Xcel Energy will coordinate with GRE to modify the 115 kV remote end relay settings at both Crow Rivers (CRO GRE) and Medina

(MED GRE) substations. The Project includes removal of the 69 kV termination structure and associated foundations.

On the distribution portion of the Orono Substation project, the proposed replacement consists of:

- a 115 kV motor-operated disconnect switch and switch stand for the transformer high side disconnect and a 115 kV, 1200A, 40kA circuit switcher;
- a 118-14.3 kV, 28 MVA., load tap changing ("LTC") transformer with oil containment, high-side, and low-side station class surge arresters;
- a single-phase 13.8 kV potential transformer ("PT") (8400-120 volt);
- one 50 kVA preferred station auxiliary transformer and associated equipment;
- one 35 kV transformer-low-side box-structure to accommodate switches and conductor;
- strain bus to connect the transformer low-side box structure to a second box structure next to existing switchgear in its current location; and
- one Electrical Equipment Enclosure ("EEE") with control panels, batter, charger, PLC, terminal cabinets, furniture, heaters, AC & DC cabinets and lighting.

The distribution portion of the replacement work also includes all grounding, trenching, controls, telephone and telephone protection, and control cable. Emergency station auxiliary power would be sourced from local distribution.

4.4.2 Transmission Structures 076, 077 and 078 (Existing)

Transmission Structures 076, 077 and 078 will require replacement for the Project to accommodate the new line configuration of transmission Line 0831 and connection to the planned replacement of the Orono Substation (*see* **Figure 4** and **Appendix B, Figure B-2**). Structure 076 is located within Baker Park Reserve and it will need to be replaced in order to transition the conductors from a horizontal configuration to a vertical configuration at the new double circuit structure (replacement of existing Structure 077) that will provide the in-out connection to the proposed new Orono Substation.

For the Proposed Route the existing Structure 077 will be removed and replaced with a new single pole galvanized steel or weathering steel structure in a new location located north of its existing location, off residential property and onto HFA land located adjacent to the BNSF railroad (*see* **Figure 2** and **Appendix B, Figure B-2**). The new structure will be renumbered as Structure 076-1.

As indicated above, the existing Structure 077 will be removed. A new single pole galvanized steel or weathering steel structure will be installed northwest of the new Structure 076-1 and be located on HFA land adjacent to BNSF railroad right-of-way (*see* **Figure 2** and **Appendix B, Figure B-2**). This new structure will be numbered Structure 077.

Existing Structure 078 is located west of existing Structure 077 on HFA land. Similar to Structure 076, Structure 078 will need to be replaced to transition the conductors from a horizontal

configuration to a vertical configuration at the new double circuit Structure 076-1 and the connection to the new Orono Substation.

4.5 Design Options to Accommodate Future Transmission Lines

The proposed double circuit 115 kV transmission line is designed to meet current and projected needs. In addition, the proposed replacement of the Orono Substation will be designed and constructed for accommodating future transmission line interconnections. The proposed new substation will include one new 115 kV, 2000A, group-operated, bus tie disconnect switch to minimize outages when a second future, transformer is installed. It will also provide a low profile layout to accommodate two transformers and four switchgear enclosures and space for a future 13.8 kV bus-tie connection between the distribution transformers. The proposed conductor for the Project is 795 kcmil 26/7 ACSS which will allow for future reconductor of Line 0831.

5.0 ENGINEERING DESIGN, CONSTRUCTION AND RIGHT-OF-WAY ACQUISITION

5.1 Structures, Right-of-Way, Construction and Maintenance

5.1.1 Transmission Structures

The 115 kV transmission line is proposed to be constructed partially as a single circuit line and partially as a double-circuit line with both portions using single-pole, galvanized or weathering steel poles placed on drilled pier foundations. Pictures of the proposed structure types are shown below **Figures 3 to 5**.

Figure 3
Photo of Typical 115 kV Double Circuit Steel Davit Arm Structure

Figure 4
Photo of Typical 115 kV Single Circuit Steel Davit Arm Structure

Figure 5
Photo of Typical 115 kV Single Circuit Steel Braced Post Structure

Direct embedded galvanized steel or weathering steel poles with davit arms are proposed to be used for the tangent structures if soil conditions warrant. Rock-filled culvert foundations may be required in areas with poor soils. Self-supporting galvanized steel or weathering steel poles with davit arms or braced post on concrete foundations are proposed to be used for long-span, angle, and dead-end structures.

The height of single circuit poles will average between 70 and 90 feet and the double circuit structures will average between 75 and 115 feet. The average span for the structures will be approximately 300 to 400 feet, with a maximum span of approximately 500 feet to keep the conductor within existing right-of-way, where applicable. **Table 5** summarizes the structure design and foundation for the line.

Table 5
Structure Design Summary

Line Type	Structure Type	Structure Material	Right-of-Way Width (feet)	Structure Height (feet)	Structure Base Diameter (inches)	Foundation Diameter (feet)	Span Between Structures (feet)
Single Circuit 115 kV	Single Pole Braced Post or Davit Arm	Galvanized Steel or Weathering Steel	75	70-90	24 to 42: tangent structures 36 to 42: angle structures	5 to 8	300 to 500

Line Type	Structure Type	Structure Material	Right-of-Way Width (feet)	Structure Height (feet)	Structure Base Diameter (inches)	Foundation Diameter (feet)	Span Between Structures (feet)
Double Circuit 115/115 kV	Single Pole, Davit Arm	Galvanized Steel or Weathering Steel	75	75-115	Direct embedded or 4 foot diameter culvert or 6 to 8 foot concrete	Direct embedded for tangents and self-supporting for angle/ dead-end and switch structures 6 to 8	300 to 500

The proposed transmission line will be designed to meet or surpass relevant local and state codes, the National Electric Safety Code ("NESC"), North American Electric Reliability Corporation ("NERC") requirements and Company standards. Appropriate standards will be met for construction and installation, and applicable safety procedures will be followed during and after installation. The 115 kV conductor proposed for the Project will be 795 thousand circular mil ("kcmil") 26/7 Aluminum Core Steel Supported ("ACSS") conductor per phase.

5.1.2 Right-of-Way Width

Xcel Energy typically requires a right-of-way of 75 feet wide (37'6" from centerline of structure) for new 115 kV transmission line construction such as that proposed in this Project. *See* **Figures 6 - 8**. In locations with existing rights-of-way or other engineering or site considerations, the Project may be designed to fit within a smaller right-of-way.

Where the transmission line parallels other existing infrastructure right-of-way (e.g., roads, railroads, other utilities), an easement of lesser width may be sufficient as part of the right-of-way of the existing infrastructure, which can often be combined with the right-of-way needed for the transmission line. With the pole placement proposed for this Project, the transmission line shares the existing right-of-way, thereby reducing the size of the easement required from the private landowner.

When the transmission line is parallel to a roadway or railroad, poles will generally be placed 5 feet within the private right-of-way adjacent to the roadway or railroad. Therefore, a little less than half of the line right-of-way will share the existing roadway or railroad right-of-way, resulting in an easement of lesser width being required from the landowner. In general, the structures will be placed as close to the property line as practical. Xcel Energy will work with industry standard practices and applicable roadway authorities and the BNSF railroad to position and manage the right of way.

Figure 6
Typical Dimensions and
Right-of-Way Requirements
For Double Circuit 115/115 kV Davit Arm Structure

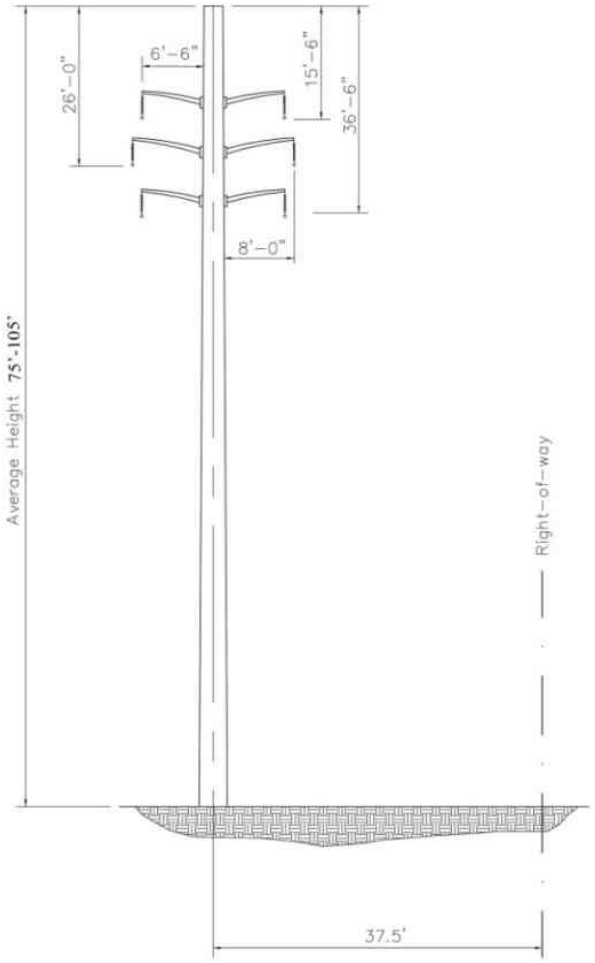


Figure 7
Typical Dimensions and Right-of-Way Requirements
for Single Circuit 115 kV Davit Arm Structure

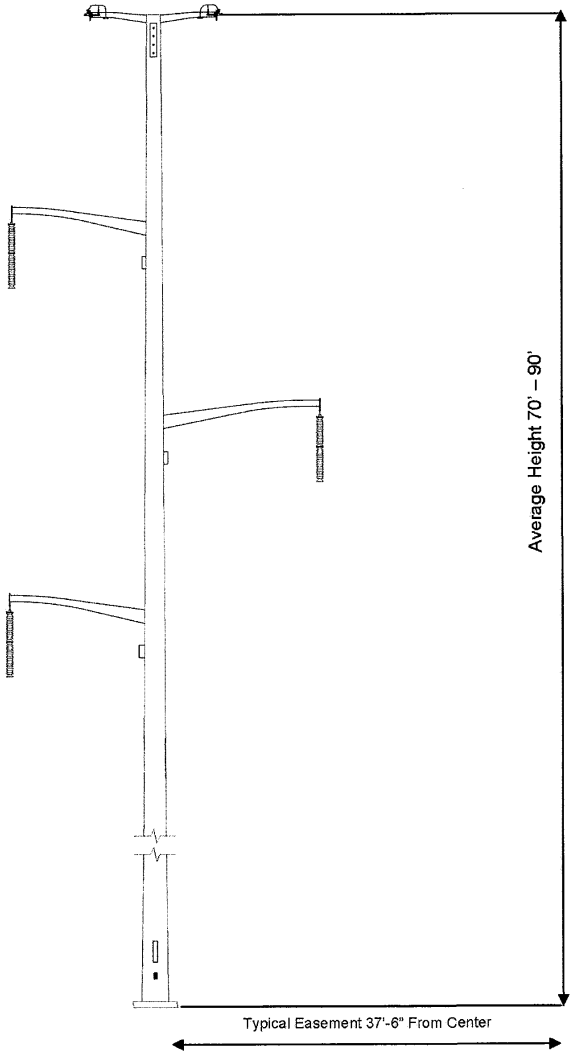
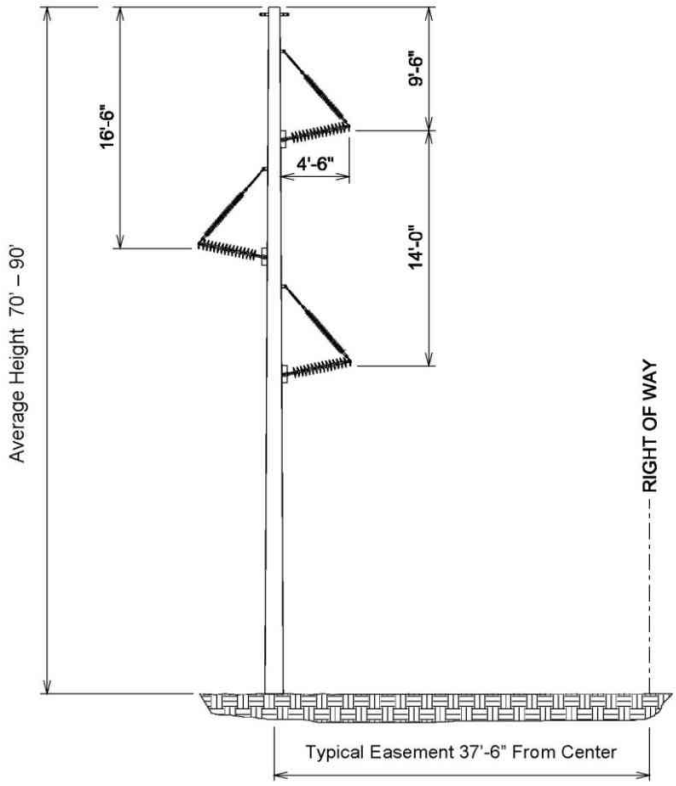


Figure 8
Typical Dimensions and Right-of-Way Requirements for
Single Circuit 115 kV Braced Post Structure



When the transmission line is placed cross-country across private land, an easement for the entire right-of-way (up to 75 feet wide) will be acquired from the affected landowner(s). Xcel Energy plans to locate the poles as close to property division lines as reasonably possible. **Figures 6-8** show the right-of-way requirements for the proposed structure.

Xcel Energy will work within existing right-of-way for the Project whenever reasonably possible. The eastern portion of the Proposed Route is located within the existing Xcel Energy Orono Substation site, and no transmission corridor or easements are required for this part of the Project. The transmission easement for existing Line 0831 and Structures 076 and 078 will be used as much as possible for that portion of the Project where realignment of existing single circuit 115 kV transmission line is being considered. In locations where existing easements are insufficient for this Project, new or modified easements will be obtained, if required.

Approximately 866 feet of the Proposed Route will not require new right-of-way as it is proposed to be constructed on Company owned property.

Approximately 1,795 feet of new right-of-way will need to be acquired from the HFA for the Proposed Route on HFA land along the south side of the BNSF railroad and U.S. Highway 12. This portion of the Proposed Route is anticipated to be located on HFA land approximately five feet south of the BNSF railroad right-of-way. Approximately 475 feet of new right-of-way will also need

to be acquired where the Proposed Route turns southwest at the western edge of the Project near the terminations point at existing Xcel Structure 078 of transmission Line 0831.

5.1.3 Right-of-Way Evaluation and Acquisition

Where the Project is expected to use existing rights-of-way, the right-of-way agent will evaluate all existing easements. If the terms of the existing easement are sufficient and no new right-of-way is needed, the right-of-way agent will continue to work with the landowner to address any construction needs, access, impacts, damages, or restoration issues. To the extent new right-of-way acquisition is necessary, the right-of-way agent will work with landowners to determine how to expand or modify existing easements. The current status of this evaluation is further discussed in Sections 8.1 to 8.3 of this Application.

For those segments of the Project where new right-of-way will be necessary, the acquisition process begins early in the detailed design phase. For transmission lines, utilities acquire easement rights across certain parcels to accommodate the facilities. The evaluation and acquisition process includes title examination, initial owner contacts, survey work, document preparation, and purchase. Each of these activities, particularly as it applies to easements for transmission line facilities, is described in more detail below.

The first step in the right-of-way process is to identify all persons and entities that may have a legal interest in the real estate upon which the facilities will be built. To compile this list, a right-of-way agent or other persons engaged by the utility will complete a public records search of all land involved in the Project. A title report is then developed for each parcel to determine the legal description of the property and the owner(s) of record of the property, and to gather information regarding easements, liens, restriction, encumbrances, and other conditions of record.

After owners are identified, a right-of-way representative contacts each property owner or the property owner's representative. The right-of-way agent describes the need for the transmission facilities and how the Project may affect each parcel. The right-of-way agent also seeks information from the landowner about any specific construction concerns.

The next step in the acquisition process is evaluation of the specific parcel. For this work, the right-of-way agent may request permission from the owner for survey crews to enter the property to conduct preliminary survey work. Permission may also be requested to take soil borings to assess the soil conditions and determine appropriate foundation design. Surveys are conducted to locate the right-of-way corridors, natural features, man-made features, and associated elevations for use during the detailed engineering of the line. The soil analysis is performed by an experienced geotechnical testing laboratory.

During the evaluation process, the location of the proposed transmission line or substation facility may be staked with permission of the property owner. This means that the survey crew locates each structure or pole on the ground and places a surveyor's stake to mark the structures or substation facility's anticipated location. By doing this, the right-of-way agent can show the landowner where the structure(s) will be located on the property. The right-of-way agent may also delineate the boundaries of the easement area required for safe operation of the line.

Prior to the acquisition of easements or fee purchase of property, land value data will be collected. Based on the impact of the easement or purchase to the market value of each parcel, a fair market

value offer will be developed. The right-of-way agent then contacts the property owner(s) to present the offer for the easement and discuss the amount of just compensation for the rights to build, operate, and maintain the transmission facilities within the easement area and reasonable access to the easement area. The agent will also provide maps of the line route or site and maps showing the landowner's parcel. The landowner is allowed a reasonable amount of time to consider the offer and to present any material that the owner believes is relevant to determining the property's value. This step is often performed prior to full evaluation in the form of an "option to purchase" contract and can be very helpful in obtaining permission for completion of all necessary evaluations.

In nearly all cases, utility companies are able to work with the landowners to address their concerns and an agreement is reached for the utility's purchase of land rights. The right-of-way agent prepares all of the documents required to complete each transaction. Some of the documents that may be required include easement, purchase agreement, contract, and deed.

In rare instances, a negotiated settlement cannot be reached and the landowner chooses to have an independent third party determine the value of the rights taken. Such valuation is made through the utility's exercise of the right of eminent domain pursuant to Minnesota Statutes, Chapter 117. The process of exercising the right of eminent domain is called condemnation.

Before commencing a condemnation proceeding, the right-of-way agent must obtain at least one appraisal for the property proposed to be acquired and a copy of that appraisal must be provided to the property owner. Minn. Stat. § 117.036, subd. 2(a). The property owner may also obtain another property appraisal and the company must reimburse the property owner for the cost of the appraisal according to the limits set forth in Minnesota Stat. § 117.036, subd. 2(b). The property owner may be reimbursed for reasonable appraisal costs up to $1,500 for single-family and two-family residential properties, $1,500 for property with a value of $10,000 or less, and $5,000 for other types of properties.

To start the formal condemnation process, a utility files a Petition in the district court where the property is located and serves that Petition on all owners of the property. If the court grants the Petition, the court then appoints a three-person condemnation commission that will determine the compensation for the easement. The three people must be knowledgeable of applicable real estate issues. Once appointed, the commissioners schedule a viewing of the property over and across which the transmission line easement is to be located. Next, the commission schedules a valuation hearing where the utility and landowners can testify as to the fair market value of the easement or fee. The commission then makes an award as to the value of the property acquired and files it with the court. Each party has 40 days from the filing of the award to appeal to the district court for a jury trial. In the event of an appeal, the jury hears land value evidence and renders a verdict. At any point in this process, the case can be dismissed if the parties reach a settlement.

As part of the right-of-way acquisition process, the right-of-way agent will discuss the construction schedule and construction requirements with the owner of each parcel. To ensure safe construction of the line, special consideration may be needed for fences, crops, or livestock. For instance, fences may need to be moved, temporary or permanent gates may need to be installed; crops may need to be harvested early; and livestock may need to be moved. In each case the right-of-way agent and construction personnel coordinate these processes with the landowner.

5.1.4 Transmission Construction Procedures

Construction will begin after federal, state, and local approvals are obtained, property and rights-of-way are acquired, soil conditions are established and final design is completed. The precise timing of construction will take into account various requirements that may be in place due to permit conditions, system loading issues, material procurement and available workforce.

Construction will follow standard construction and mitigation practices, including best management practices ("BMPs") that were developed from experience with past transmission facility projects as well as any specific conditions identified in the Route Permit. These practices address right-of-way clearance, staging, erecting transmission line structures, and stringing transmission lines. Construction and mitigation practices to minimize impacts will be developed based on the proposed schedule for activities, permit requirements, prohibitions, maintenance guidelines, inspection procedures, terrain, and other factors. In some cases, activities or schedules are modified to minimize impacts on sensitive environments.

Transmission line structures are generally designed for installation at existing grades. Typically, structure sites with 10 percent or less slope will not be graded or leveled. Sites with more than 10 percent slope will have working areas graded level or fill brought in for working pads. If the landowner permits, it is preferred to leave the leveled areas and working pads in place for use in future maintenance activities, if any. If permission is not obtained, the site is graded back to its original condition to the extent possible and imported fill is removed.

Typical construction equipment used on a project consists of tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, dump trucks, front end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks, and various trailers. Many types of excavation equipment are set on wheel or track-driven vehicles. Poles are transported on tractor-trailers. Staging areas are often established for a project. Staging involves delivering the equipment and materials necessary to construct the new transmission line facilities. The materials are stored at staging areas until they are needed for a project.

Staging areas may also be required for additional space for storage during construction. To the extent possible, Xcel Energy will use the existing Orono Substation site or other nearby Xcel Energy substation sites as staging areas for the Project. These areas will be selected for their location, access, security, and ability to efficiently and safely warehouse supplies. If needed, any temporary staging areas outside of the transmission line right-of-way or at non-Xcel Energy sites will be obtained through rental agreements.

Access to the transmission line right-of-way corridor is made directly from existing roads or trails that run parallel or perpendicular to the transmission line right-of-way. In some situations, private field roads or trails are used. Existing access roads may be upgraded or new roads may be constructed where necessary to accommodate the heavy equipment used in construction, including cranes, cement trucks and hole drilling equipment. New access roads may also be constructed when no current access is available or the existing access is inadequate to cross roadway ditches. To the extent possible, these activities are coordinated with the owner of the property affected.

When it is time to install the poles (structures), they are generally moved from the staging areas and delivered to the staked location. The poles are typically placed within the right-of-way until the pole

is set. Insulators and other hardware are attached while the pole is on the ground. The pole is then lifted, placed and secured using a crane.

Poles that are considered medium angle, heavy angle or deadened structures will have concrete foundations, also referred to as drilled pier foundations. In those cases, holes are drilled in preparation for the foundation. Drilled pier foundations may vary from approximately 5 to 7 feet in diameter and 25 or more feet in depth, depending on soil conditions. After the concrete foundation is set, the pole is bolted to the foundation. Tangent and light angle structures may be placed on poured concrete foundations or direct embedded. Direct embedding involves digging a hole for each pole, filling it partially with crushed rock and then setting the pole on top of the rock base. The area around the pole is then backfilled with crushed rock and/or soil.

Environmentally sensitive and wetland areas may require special construction techniques, which may vary according to conditions at the time of construction. During construction, impacts on wetland areas will be minimized to the extent possible. Additionally, construction practices that help prevent soil erosion will be utilized and measures will be taken to ensure that equipment fueling and lubricating will occur at a distance from waterways. Additional mitigative measures relating to wetlands are contained in Section 6.5.4.

5.1.5 Restoration Procedures

During construction, crews will attempt to limit ground disturbance wherever possible. However, areas are disturbed during the normal course of work, which can take several weeks in any one location. As construction is completed, disturbed areas are restored to their original condition to the maximum extent practicable.

The right-of-way agent attempts to contact each property owner after construction is completed to see if any remaining damage has occurred as a result of a project. If damage has occurred to crops, fences or the property, Xcel Energy will fairly reimburse the landowner for the damages sustained that are not repaired or restored by Xcel Energy or its representatives. In some cases, Xcel Energy may engage an outside contractor to restore the damaged property as nearly as possible to its original condition. Portions of vegetation that are disturbed or removed during construction of transmission lines will naturally reestablish to pre-disturbance conditions. Resilient species of common grasses and shrubs typically reestablish with few problems after disturbance. Areas with significant soil compaction and disturbance from construction activities along the proposed transmission line corridor may require assistance in reestablishing the vegetation stratum and controlling soil erosion. Commonly used methods to control soil erosion and assist in reestablishing vegetation include, but are not limited to:

- re-seeding and mulching;
- erosion control blankets;
- silt fence installation; and
- minimizing soil disturbance during construction.

These erosion control and vegetation establishment practices are regularly used in construction projects and are referenced in the construction permit plans. Long-term impacts are minimized by using these construction techniques.

5.1.6 Maintenance Procedures

Transmission lines and substations are designed to operate for decades and require only moderate maintenance, particularly in the first few years of operation.

The estimated service life of a transmission line for accounting purposes is approximately 40 years. However, practically speaking, transmission lines are seldom completely retired. Transmission infrastructure has very few mechanical elements and is built to withstand weather extremes that are normally encountered. With the exception of severe weather such as tornadoes and heavy ice storms, transmission lines rarely fail. Transmission lines are automatically taken out of service by the operation of protective relaying equipment when a fault is sensed on the system. Such interruptions are usually only momentary. Scheduled maintenance outages are also infrequent. As a result, the average annual availability of transmission infrastructure exceeds 90 percent.

The principal operating and maintenance cost for transmission facilities is the cost of inspections, usually done monthly by air. Annual operating and maintenance costs for transmission lines in Minnesota and the surrounding states vary. For transmission lines with voltages ranging from 69 kV through 345 kV, experience shows that the annual maintenance cost is approximately $300 to $500 per mile. Actual line-specific maintenance costs depend on the setting, the amount of vegetation management necessary, storm damage occurrences, structure types, materials used, and the age of the line.

Substations require a certain amount of maintenance to keep them functioning in accordance with accepted operating parameters and the NESC and NERC requirements. Transformers, circuit breakers, batteries, protective relays, and other equipment need to be serviced periodically in accordance with the manufacturer's recommendation. The site itself must be kept free of vegetation and drainage maintained.

5.2 Electric and Magnetic Fields

The term electromagnetic fields ("EMF") refer to electric and magnetic fields that are coupled together, such as in high frequency radiating fields. For the lower frequencies associated with power lines (referred to as "extremely low frequencies" ["ELF"]), EMF should be separated into electric fields ("EFs") and magnetic fields ("MFs"), measured in kilovolts per meter ("kV/m") and milliGauss ("mG"), respectively. These fields are dependent on the voltage of a transmission line (EFs) and current carried by a transmission line (MFs). The intensity of the electric field is proportional to the voltage of the line, and the intensity of the magnetic field is proportional to the current flow through the conductors. Transmission lines operate at a power frequency of 60 hertz (cycles per second).

5.2.1 Electric Fields

There is no federal standard for transmission line electric fields. The Commission, however, has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground in its previously issued permits, including the recent order *In the Matter of the Route Permit Application for a*

345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota, Docket No. ET-2/TL-08-1474, Order Granting Route Permit (*adopting* ALJ Findings of Fact, Conclusions and Recommendation at Finding 194 (April 22, 2010 and amended April 30, 2010)) (September 14, 2010). The standard was designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater. Other concerns that have been raised regarding electric fields include biological responses and health effects, stray voltage, noise, television and radio interference, further discussed herein. The maximum electric field, measured at one meter (3.28 feet) above ground, associated with the Project is calculated to be 0.437 kV/m (*see* **Table 6** below).

Table 6
Calculated Electric Fields (kV/m) for Proposed Transmission Line Design
(3.28 feet above ground)

Structure Type	Maximum Operating Voltage (kV)	Distance to Proposed Centerline (feet)												
		-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
Single Pole Davit Arm 115 kV Single Circuit	121	.007	.018	.089	.154	.267	.364	.345	.390	.222	.113	.062	.012	.005
Single Pole Braced Post 115 kV Single Circuit	121	.005	.012	.051	.087	.153	.243	.392	.331	.163	.084	.050	.013	.006
Single Pole Davit Arm 115 kV/115kV Double Circuit	121	.002	.005	.011	.005	.071	.341	.437	.341	.071	.005	.011	.005	.002

5.2.2 Magnetic Fields

There are presently no Minnesota regulations pertaining to MF exposure. Xcel Energy provides information to the public, interested customers and employees so they can make informed decisions about MFs. Such information includes the availability for measurements to be conducted for customers and employees upon request.

The magnetic field profiles around the proposed transmission lines for each structure and conductor configuration being considered for the Project is shown in **Table 7**. Magnetic fields were calculated under normal system conditions (systems intact) for the expected peak and average current flows as projected for the year 2011-2021. The peak magnetic field values are calculated at a point directly under the transmission line and where the conductor is closest to the ground. The same method is used to calculate the magnetic field at the edge of the right-of-way. The magnetic field profile data show that magnetic field levels decrease rapidly as the distance from the centerline increases (proportional to the inverse square of the distance from source).

The magnetic field produced by the transmission line is dependent on the current flowing on its conductors. Therefore, the actual magnetic field when the Project is placed in service is typically less than shown in the charts. This is because the charts represent the magnetic field with current flow at expected normal peak based on projected regional load growth through 2011-2021, the maximum load projection timeline available. Actual current flow on the line will vary, so magnetic fields will be less than peak levels during most hours of the year.

Table 7
Calculated Magnetic Flux Density (milligauss) for Proposed Transmission Line Design
(3.28 feet above ground)

Segment	System Condition	Current (Amps)	Distance to Proposed Centerline (feet)												
			-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
Single Pole Davit Arm 115 kV Single Circuit	Peak	250	0.34	0.72	2.42	3.75	6.19	10.20	12.17	10.50	6.29	3.72	2.35	0.65	0.29
	Average	150	0.20	0.43	1.45	2.25	3.71	6.12	7.90	6.30	3.77	2.23	1.41	0.39	0.17
Single Pole Braced Post 115 kV Single Circuit	Peak	250	0.27	0.57	1.86	2.84	4.60	7.46	9.64	7.78	4.75	2.85	1.81	0.50	0.22
	Average	150	0.16	0.34	1.12	1.70	2.76	4.48	5.78	4.67	2.85	1.71	1.09	0.30	0.13
Single Pole Davit Arm 115kV/115kV Double Circuit	Peak	250	0.04	0.11	0.69	1.38	3.18	7.86	12.82	7.74	3.08	1.33	0.66	0.10	0.04
	Average	150	0.02	0.07	0.42	0.83	1.91	4.72	7.69	4.64	1.85	0.80	0.39	0.06	0.02

Note: The assumed peak and average line loading assumed for these calculations is the estimated flow of 50MVA.

Considerable research has been conducted throughout the past three decades to determine whether exposure to power-frequency (60 hertz) magnetic fields causes biological responses and health effects. Epidemiological and toxicological studies have shown no statistically significant association or weak associations between MF exposure and health risks. Public health professionals have also investigated the possible impact of exposure to EMF upon human health for the past several decades. While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields can cause biological responses or health effects continues to be debated.

In 1999, the National Institute of Environmental Health Sciences ("NIEHS") issued its final report on "Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields" in response to the Energy Policy Act of 1992. The NIEHS concluded that the scientific evidence linking MF exposures with health risks is weak and that this finding does not warrant aggressive regulatory concern. However, because of the weak scientific evidence that supports some association between MFs and health effects and the common exposure to electricity in the United States, passive regulatory action, such as providing public education on reducing exposures, is warranted.

In 2007, the World Health Organization ("WHO") concluded a review of the health implications of electromagnetic fields. In this report, the WHO stated:

> Uncertainties in the hazard assessment [of epidemiological studies] include the role that control selection bias and exposure misclassification might have on the observed relationship between magnetic fields and childhood leukemia. In addition, virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level ELF magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered causal, but sufficiently strong to remain a concern. (*Environmental Health Criteria Volume N°238 on Extremely Low Frequency Fields* at p. 12, WHO (2007)).

Also, regarding disease outcomes, aside from childhood leukemia, the WHO stated that:

> A number of other diseases have been investigated for possible association with ELF magnetic field exposure. These include cancers in children and adults, depression, suicide, reproductive dysfunction, developmental disorders, immunological modifications and neurological disease. The scientific evidence supporting a linkage between ELF magnetic fields and any of these diseases is much weaker than for childhood leukemia and in some cases (for example, for cardiovascular disease or breast cancer) the evidence is sufficient to give confidence that magnetic fields do not cause the disease. (*Id.* at p. 12.)

Furthermore, in their "Summary and Recommendations for Further Study" WHO emphasized that:

> The limit values in [ELF-MF] exposure guidelines [should not] be reduced to some arbitrary level in the name of precaution. Such practice undermines the scientific foundation on which the limits are based and is likely to be an expensive and not necessarily effective way of providing protection. (*Id.* at p. 12).

Although WHO recognized epidemiological studies indicate an association on the range of three to four mG, WHO did not recommend these levels as an exposure limit but instead provided: "The best source of guidance for both exposure levels and the principles of scientific review are international guidelines." *Id.* at pp. 12-13. The international guidelines referred to by WHO are the International Commission on Non-Ionizing Radiation Protection ("ICNIRP") and the Institute of Electrical and Electronic Engineers ("IEEE") exposure limit guidelines to protect against acute effects. *Id.* at p. 12. The ICNIRP-1998 continuous general public exposure guideline is 833 mG and the IEEE continuous general public exposure guideline in 9,040 mG. In addition, WHO determined that "the evidence for a casual relationship [between ELF-MF and childhood leukemia] is limited, therefore exposure limits based on epidemiological evidence is not recommended, but some precautionary measures are warranted." *Id.* at 355-56.

WHO concluded that:

> given both the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukemia, and the limited impact on public health if there is a link, the benefits of exposure reduction on health are unclear. Thus, the costs of precautionary measures should be very low... Provided that the health, social and economic benefits of electric power are not compromised, implementing very low-cost precautionary procedures to reduce exposure is reasonable and warranted. (*Id.* at p. 13).

Wisconsin, Minnesota and California have all conducted literature reviews or research to examine this issue. In 2002, Minnesota formed an Interagency Working Group ("Working Group") to evaluate the body of research and develop policy recommendations to protect the public health from any potential problems resulting from HVTL EMF effects. The Working Group consisted of staff from various state agencies and published its findings in a White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options in September 2002, (Minnesota Department of Health, 2002). The report summarized the findings of the Working Group as follows:

> Research on the health effects of EMF has been carried out since the 1970s. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to EMF and health effects, some have shown a weak association. More recently, laboratory studies have failed to show such

> an association, or to establish a biological mechanism for how magnetic fields may cause cancer. A number of scientific panels convened by national and international health agencies and the United States Congress have reviewed the research carried out to date. Most researchers concluded that there is insufficient evidence to prove an association between EMF and health effects; however, many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe. (*Id.* at p. 1.)

The Public Service Commission of Wisconsin ("PSCW") has periodically reviewed the science on MFs since 1989 and has held hearings to consider the topic of MF and human health effects. The most recent hearings on MF were held in July 1998. Recently, January 2008, the PSC published a fact sheet regarding MFs. In this fact sheet the PSC noted that:

> Many scientists believe the potential for health risks for exposure to EMF is very small. This is supported, in part, by weak epidemiological evidence and the lack of a plausible biological mechanism that explains how exposure to EMF could cause disease. The magnetic fields produced by electricity are weak and do not have enough energy to break chemical bonds or to cause mutations in DNA. Without a mechanism, scientists have no idea what kind of exposure, if any, might be harmful. In addition, whole animal studies investigating long-term exposure to power frequency EMF have shown no connection between exposure and cancer of any kind. (*EMF-Electric & Magnetic Fields*, PSC (January 2008)).

The Minnesota Public Utilities Commission, based on the Working Group and World Health Organization findings, has repeatedly found that "there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects." *In the Matter of the Application of Xcel Energy for a Route Permit for the Lake Yankton to Marshall Transmission Line Project in Lyon County*, Docket No. E-002/TL-07-1407, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to Xcel Energy for the Lake Yankton to Marshall Transmission Project at p. 7-8 (Aug. 29, 2008); *See also*, *In the Matter of the Application for a HVTL Route Permit for the Tower Transmission Line Project*, Docket No. ET-2, E015/TL-06-1624, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to Minnesota Power and Great River Energy for the Tower Transmission Line Project and Associated Facilities at p. 23 (Aug. 1, 2007)("Currently, there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects.").

The Commission again confirmed its conclusion regarding health effects and MFs in the Brookings County – Hampton 345 kV Route Permit proceeding ("Brookings Project"). In the Brookings Project Route Permit proceeding, Applicants Great River Energy and Xcel Energy and one of the intervening parties provided expert evidence on the potential impacts of electric and magnetic fields on human health. The ALJ in that proceeding evaluated written submissions and a day-and-half of testimony from these two expert witnesses. The ALJ concluded: "there is no demonstrated impact on human health and safety that is not adequately addressed by the existing State standards for [EF or MF] exposure." *In the Matter of the Route Permit Application by Great River Energy and Xcel Energy for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota*, Docket No. ET-2/TL-08-1474, ALJ Findings of Fact, Conclusions and Recommendation at Finding 216 (April 22, 2010 and amended April 30, 2010). The Commission adopted this finding on July 15, 2010. *In the Matter of the Route Permit Application by Great River Energy and Xcel Energy for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota*, Docket No. ET-2/TL-08-1474, Order Granting Route Permit (September 14, 2010).

5.2.3 Stray Voltage

Stray voltage (also known as Neutral to Earth Voltage ("NEV")) is a condition that can occur on the electric service entrances to structures from distribution lines, not transmission lines. More precisely, stray voltage is a voltage that exists between the neutral wire of the service entrance and grounded objects in buildings, such as barns and milking parlors. Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences. Transmission lines, however, can induce stray voltage on a distribution circuit that is parallel to and immediately under the transmission line.

5.3 Farming Operations, Vehicle Use, and Metal Buildings Near Power Lines

Insulated electric fences used in livestock operations can pick up an induced charge from transmission lines. Usually, the induced charge will drain off when the charger unit is connected to the fence. When the charger is disconnected either for maintenance or when the fence is being built, shocks may result. Potential shocks can be prevented by using a couple of methods including:

i) one or more of the fence insulators can be shorted out to ground with a wire when the charger is disconnected; or

ii) an electric filter can be instilled that grounds out charges induced from a power line while still allowing the charger to be effective.

Farm equipment, passenger vehicles, and trucks may be safely used under and near power lines. The power lines will be designed to meet or exceed minimum clearance requirements over roads, driveways, cultivated fields, and grazing lands specified by the NESC. Recommended clearances within the NESC are designed to accommodate a relative vehicle height of 14 feet.

There is a potential for vehicles under HVTLs to build up an electric charge. If this occurs, the vehicle can be grounded by attaching a grounding strap to the vehicle long enough to touch the earth. Such buildup is a rare event because generally vehicles are effectively grounded through tires. Modern tires provide an electrical path to ground because carbon black, a good conductor of electricity, is added when they are produced. Metal parts of farming equipment are frequently in contact with the ground when plowing or engaging in various other activities. Therefore, vehicles will not normally build up a charge unless they have unusually old tires or are parked on dry rock, plastic or other surfaces that insulate them from the ground.

Buildings are permitted near transmission lines but are generally prohibited within the right-of-way itself because a structure under a line may interfere with safe operation of the transmission facilities. For example, a fire in a building on the right-of-way could damage a transmission line. As a result, NESC guidelines establish clear zones for transmission facilities. Metal buildings may have unique issues. For example, metal buildings near power lines of 200 kV or greater must be properly grounded. Any person with questions about a new or existing metal structure can contact Xcel Energy for further information about proper grounding requirements.

If a customer suspects that stray voltage/NEV is a concern on their property, they can call the Company stray voltage hotline. The customer can contact an Xcel Energy technician or engineer and discuss the situation. If an on-farm investigation is warranted it will be scheduled. On the day of the investigation, the Xcel Energy team will arrive and conduct an investigation of the utility

system serving the farm and the farm wiring. The team will discuss the preliminary results with the customer before leaving the farm. In most instances, recording volt meters will be set to measure activity over several days. A few days later these will be retrieved and taken to the Company for analysis. Upon completing the analysis, an Xcel Energy engineer or technician will call the farmer to discuss the results.

6.0 LAND USE, RECREATION, AND HISTORIC AND NATURAL RESOURCES

6.1 Description of Environmental Setting

The approximate 16 acre Orono Substation site is located in an open upland area adjacent to and south of BNSF railroad, a Metropolitan Council sewer line and , west of County Road 6 and east of the HFA residential subdivision in the City of Orono, Hennepin County, Minnesota (*see* **Figure 1** and **Appendix B**). Typical lots sizes in this subdivision range from 2 to 4 acres. The HFA, comprised of landowners within the subdivision, also owns approximately 64 acres of undeveloped land surrounding the residential lots. HFA land generally consists of wetland areas and is no longer under agricultural use. Three Rivers Park District's Baker Park Reserve is located north of U.S. Highway 12, the Metropolitan Council sewer line and the BNSF railroad.

The replacement of the existing Orono Substation located on the previously discussed 16 acre substation site is part of the overall proposed transmission line Project and is discussed in Section 4.4.1. This portion of the Project includes replacing the existing 69 kV substation with a 115 kV substation facility that is being constructed to provide a more reliable system to those areas served by transmission Line 0831. The existing fenced area of the substation site comprises approximately 0.1 acres. The new substation fenced area will comprise approximately 1.2 acres.

A portion of the Proposed Route (866 feet) for construction of the new transmission line is located in upland and wetland areas within the 16 acre Orono Substation site. Xcel Energy put great emphasis on utilizing this site to the greatest extent possible when reviewing potential routes for the Project. By utilizing the existing substation site property, Xcel Energy was able to directly route the transmission line to an existing transportation corridor to minimize impacts to the neighboring properties.

Upon exiting the proposed substation replacement area, the Proposed Route takes a direct path to the western property line and follows the property line north to the existing BNSF right-of-way. Together, the Proposed Route follows the existing BNSF right-of-way and is within Xcel Energy owned property for 85 percent of the Route. While the route parallels the BNSF right-of-way it will be within the HFA subdivision. The proposed interconnection point with Xcel Energy's existing 115 kV transmission Line 0831 is also located within a wooded upland area on HFA land. *See* **Appendix B-2**. Approximately 1,795 feet (57 percent) of the Proposed Route parallels the BNSF railroad and will not conflict with current land use.

The Project is located within the Minnesota and Northeast Iowa Morainal Section (222M), a section within the biogeographic province known as the Eastern Broadleaf Forest Province under the Ecological Classification System ("ECS") developed by the Minnesota Department of National Resources ("MnDNR") and the United States Forest Service ("USFS") (MNDNR, 2010). The Project Area is further located within the Big Woods subsection of the Minnesota and Northeast Iowa Morainal Section. See **Appendix B-1**.

The Big Woods subsection generally consists of circular, level topped hills bounded by smooth side slopes. The Mississippi River runs along the eastern border of this subsection. The other major rivers within this subsection are the Minnesota and Crow Rivers and over 100 lakes greater than 160 acres in size exist within the Big Woods subsection. The area was previously occupied by oak woodland and basswood forest, with characteristic trees being elm, basswood, sugar maple and bur

oak. According to the Department of Soil Science, University of Minnesota, the subsection is predominately characterized as cropland, pasture, upland forest and wetland (Dept. of Soil Science,

Univ. of Minnesota 1973, 1980b, 1981a). Croplands and pasture lands are more predominate to the west of the Project than in the immediate area of the Project. Further, urban and rural residential development account for the majority of lands near the Project to the east and south.

6.1.1 Topography

Unlike other portions of Minnesota, the Project location was not covered by the most recent glaciations (i.e., 10,500 years before present) (Minnesota River Basin Data Center, 2010). However, melt waters and glacial lakes associated with the last glacial advance contributed large volumes of meltwater to rivers that cut deep valleys along the present course of the Minnesota, Crow, and lower Mississippi Rivers located east, north and south of the Project. The Project is within a Big Woods subsection, which contains broad level areas between hills with closed depressions containing lakes and peat bogs. The surface water drainage network is young and undeveloped, and extensive areas of wetlands are present. Drainage is often controlled by lake levels. Prior to settlement, the area consisted of forest lands and wetlands.

Today the topography of the area is level to gently rolling and has been greatly altered from pre-settlement times by residential development, roadways and interchanges, railroad and other man-made features. In general, the elevation within the Project ranges from 964 feet above sea level in wetland areas to 983 feet above sea level at the Orono Substation.

Mitigative Measures

The Project requires grading the area of the new substation site and storm water management to accommodate the substation replacement (*see* **Appendix B, Figure B-10**). To mitigate this, the preliminary design and site layout takes into account existing facilities, wetlands on the north and east sides of the parcel, storm water runoff and management, and surrounding land uses. To the extent possible, Xcel Energy will reuse the existing substation area and avoid wetlands at the site. While the western portion of the site will require grading and a new storm water pond will be installed at the northwest corner of the new substation area, the Project will not change the character of the landscape of the surrounding area.

6.1.2 Geology and Soils

The Project site geology is composed of a gently rolling landscape and wetlands. The underlying geology and topography has remained consistent over time. However, the surface topography and natural drainage ways have been impacted by human settlement. Depth of bedrock varies from 100 to 400 feet (Olsen and Mossler 1982) The Project Area is underlain by Cambrian sandstones. The area north of US Highway 12 (Baker Park Reserve) has remained relatively undeveloped as have many of the wetland complexes in the area.

Soils throughout the area are predominantly poorly drained hydric wetland soils that are derived primarily from till. Based on the Soil Survey of Hennepin County (U.S. Department of Agriculture ("USDA"), 2000), the most predominant soils in the Project location include the following two soil associations:

- Klossner Association: Very deep, very poorly drained, nearly level muck formed in organic material over glacial till in wetland depressions; and

- Houghton and Muskego Association: Very deep, very poorly drained, nearly level muck formed in organic material in wetland depressions.

Mitigative Measures

As described above, the new substation site will require grading and storm water management. Xcel Energy does not anticipate any adverse impacts to geology or bedrock from the Project. Concerning impacts from the Project to surficial soils, Xcel Energy will implement the mitigative measures as described above in Section 6.1.1.

6.2 Human Settlement

6.2.1 Public Health and Safety

Proper safeguards will be implemented for construction and operation of the proposed substation and transmission facilities. The Project will be designed in compliance with local, state, the National Electrical Safety Code ("NESC"), and Xcel Energy standards for clearance to ground, crossing utilities and buildings, strength of materials, and right-of-way widths. Construction and contract crews will comply with local, state, NESC, and Xcel Energy standards for installation of facilities and standard construction practices. Established Xcel Energy and industry safety procedures will also be followed after the substation and transmission line are installed. This will include clear signage during all construction activities.

The proposed transmission line will be equipped with protective devices (circuit breakers and relays located in the new Orono Substation where the transmission lines terminate) to safeguard the public if an accident occurs, such as a structure or conductor falling to the ground. The protective equipment will de-energize the transmission line should such an event occur. In addition, the new Orono Substation will be fenced and access limited to authorized personnel. Proper signage is posted to warn the public about the risk of coming into contact with the energized equipment. For a discussion of EMF, see Section 5.2 above.

Mitigative Measures

Xcel Energy does not anticipate any adverse public health and safety impacts from the Project. Therefore, no mitigative measures are proposed.

6.2.2 Commercial, Industrial, and Residential Land Use

In addition to use of Xcel Energy's existing 16 acre site for the Orono Substation land use near the Project is primarily residential and undeveloped/open-space. The City of Orono is the largest municipality in the local area, with a current projected population of 7,437 (US Census Bureau, American FactFinder website-accessed 04/05/2011). The entire Project and proposed transmission facilities fall within the current City limits as indicated in the attached **Appendix B-4**. The existing Orono Substation property is zoned for rural residential use, but has a conditional use permit through the City of Orono for this property. The areas near and around the Project are zoned for rural residential use. The proposed new transmission line will have minimal impact on the amount

of developable land in this area as it is sited within existing Xcel Energy property, adjacent to existing highway and railroad rights-of-way, and within undeveloped HFA land.

The closest commercial business is a gas station located in the City of Maple Plain approximately 0.75 miles northwest from the proposed Project. This structure is located on the northeast corner of the intersection of U.S. Highway 12 and County Road 19. *See* **Appendix B-3**.

The closest rural residence to the proposed new transmission line and substation replacement is located approximately 220 feet south and across 6th Avenue North from the proposed Orono Substation replacement area. The closest farmstead residence is located approximately 0.5 miles directly south of the beginning of the proposed line at a residence on Orchard Park Road which is approximately 600 feet north of Watertown Rd. *See* **Appendix B-2**.

The numbers of occupied structures located within various distances from the Project are shown in **Table 8** below.

Table 8
Distance to Occupied Structures

Segment	Number of Farmsteads, Residences or Commercial Operations within 0-50' of Proposed Site/Line	Number of Farmsteads, Residences or Commercial Operations within 51-100' of Proposed Line	Number of Farmsteads, Residences or Commercial Operations within 101-200' of Proposed Line
Proposed Substation Replacement	0	0	0
Proposed Route	0	0	0
Alternative Route 1	0	0	1
Alternative Route 2	0	0	0
Alternative Route 3	0	0	1
Alternative Route 4	0	0	0

Mitigative Measures

Land uses near the Project are not expected to change as a result of the construction and operation of the proposed transmission line and substation. Permanent impacts will be limited to the area where structures (e.g. poles) are placed and to the construction areas as described in Section 5.1.1

For the Proposed Route, the structures and overhead transmission lines will be placed within the existing Xcel Energy property and within primarily undeveloped areas on HFA land along existing transportation corridors. Impacts to surrounding land uses will be minimized by following within or adjacent to existing roadways, railroad and utility rights-of-way as much as possible.

6.2.3 Displacement

NESC and Xcel Energy standards require certain clearances between substation and transmission line facilities and buildings for safe operation of the facilities. There is sufficient land at the existing 16 acre Orono Substation site to maintain substation clearances for the proposed expanded Orono Substation and associated new transmission line. Off of the Orono Substation site, Xcel Energy acquires appropriate right-of-way for transmission lines that is sufficient to maintain these

clearances. Displacement can occur when an existing structure is located within the right-of-way for a new transmission facility. The proposed transmission line will be designed so that all existing residences are located outside of the right-of-way. Furthermore, the Proposed Route includes realignment of existing transmission Line 0831 and associated structures off of two residential properties as part of the Project. *See* **Appendix B.2**. The proposed Project will not require displacement of occupied residences.

Mitigative Measures

It is not anticipated that any buildings or residences will be displaced by the Project. Therefore, no mitigative measures are proposed. Xcel Energy will work with landowners where buildings or residences are near the proposed transmission structures to ensure appropriate placement of such structures.

6.2.4 Noise

Transmission Line Noise

Transmission conductors produce noise under certain conditions. The level of noise depends on conductor conditions, voltage level and weather conditions.

Noise emissions from a transmission line occur during certain weather conditions. In foggy, damp, or rainy weather, power lines can create a crackling sound when a small amount of electricity ionizes the moist air near the wires. During heavy rain, the background noise level of the rain is usually greater than the noise from the transmission line. As a result, people do not normally hear noise from a transmission line during heavy rain. During light rain, dense fog, snow, and other times when there is moisture in the air, transmission lines can produce noise. Noise levels produced by a 115 kV transmission line are generally less than outdoor background levels and are therefore not usually audible.

Since human hearing is not equally sensitive to all frequencies of sound, the most noticeable frequencies of sound are given more "weight" in most measurement schemes. The A-weighted scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in decibels ("dBA"). A noise level change of 3 dBA is barely perceptible to human hearing. A 5 dBA change in noise level, however, is clearly noticeable. A 10 dBA change in noise level is perceived as a doubling of noise loudness, while a 20 dBA change is considered a dramatic change in loudness. **Table 9** shows noise levels associated with common, everyday activities.

Table 9
Common Noise Sources and Levels

Noise Source [a]	Sound Pressure Level (dBA)
Jet Engine (at 25 meters)	140
Jet Aircraft (at 100 meters)	130
Rock Concert	120
Pneumatic Chipper	110
Jackhammer (at 1 meter)	100
Chainsaw. Lawn Mower (at 1 meter)	90
Heavy Truck Traffic	80
Business Office, Vacuum Cleaner	70

Noise Source [a]	Sound Pressure Level (dBA)
Conversational Speech, Typical TV Volume	60
Library	50
Bedroom	40
Secluded Woods	30
Whisper	10

[a] *A Guide to Noise Control in Minnesota Acoustical Properties, Measurement, Analysis and Regulation*, Minnesota Pollution Control Agency ("MPCA"), 2008.

In Minnesota, statistical sound levels ("L" or Level Descriptors) are used to evaluate noise levels and identify noise impacts. The standards are expressed as a range of permissible dBA within a one hour period; L_{50} is the dBA that may be exceeded 50 percent of the time within an hour, while L_{10} may be exceeded 10 percent of the time within an hour.

Land areas, such as picnic areas, churches, or commercial spaces, are assigned to an activity category based on the type of activities or use occurring in the area. Activity categories are then categorized based on their sensitivity to traffic noise. The Noise Area Classification ("NAC" list in the MPCA noise regulations to distinguish the categories. Residential areas, churches, and similar type land use activities are included in NAC 1; commercial-type land use activities are included in NAC 2; and industrial-type land use activities are included in NAC 3. **Table 10** identifies the established daytime and nighttime noise standards by NAC.

Table 10
Noise Standards by Noise Area Classification

Noise Area Classification	Daytime Noise Standard		Nighttime Noise Standard	
	L_{50} (dBA)	L_{10} (dBA)	L_{50} (dBA)	L_{10} (dBA)
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

The noise levels from the proposed double circuit 115 kV transmission line are expected to be only slightly higher than the existing GRE 69 kV transmission line that is connected to the Orono substation. The GRE transmission line will be disconnected from the Orono Substation as a part of this Project. Therefore, noise levels from the new 115 kV transmission line should not be noticeably greater than existing levels.

The proposed transmission lines were modeled using the Bonneville Power Administration CFI8X model to evaluate audible noise from transmission lines. Where possible, the model was executed as a worst-case scenario benchmark, to ensure that noise was not under-predicted. **Table 11** presents the L_5 and L_{50} noise levels predicted for proposed transmission line structures and voltages for the Project.

Table 11
Calculated Audible Noise (dBA) for Proposed Transmission Line Design
(3.28 feet above ground)

Structure Type	Noise L_5 (Edge of Right-of-Way) (Decibels a weighted)	Noise L_{50} (Edge of Right-of-Way) (Decibels a weighted)
Single Pole Davit Arm 115 kV Single Circuit Vertical Configuration	17.4	13.9
Single Pole Braced Post 115 kV Single Circuit	18.6	15.1
Single Pole Davit Arm 115 kV/115 kV Double Circuit	23.3	19.8

Note: Noise calculations done using the EPRI Enviro software and the BPA standard method of calculation.

The noise generated from the transmission line is not expected to exceed background noise levels and will, therefore, not be audible at any receptor location. Transmission conductors and transformers at substations can produce noise when it is foggy, damp, or rainy, including a subtle cracking or humming noise. Any audible noise will be well below the MPCA noise standards established for NAC 1, as shown in **Tables 10** and **11** above.

Transformer Substation Noise

Transformer "hum" is the dominant noise source at substations. Transformer hum is caused by magnetostrictive forces within the core of the transformer. These magnetic forces cause the core laminations to expand and contract, creating vibration and sound at a frequency of 100Hz (twice the a.c. mains frequency), and at multiples of 100Hz (harmonics). Typically, the noise level does not vary with transformer load, as the core is magnetically saturated and cannot produce any more noise. Generally, activity-related noise levels during the operation and maintenance of substations and transmission lines are minimal.

The nearest occupied structures to the proposed Orono Substation and related transmission facilities associated with the Project include two residences located approximately 220 feet to the south and approximately 290 feet west (*see* **Appendix B, Figure B-2**). It is unlikely that substation noise will be audible at these structures.

The proposed substation will be designed and constructed to comply with state noise standards established by the MPCA

Mitigative Measures

The transmission lines and substation are designed and constructed to comply with state noise standards established by the MPCA. Transmission line noise levels are not expected to exceed the MPCA noise standards outside the right-of-way for all NACs. Likewise, substation noise will not exceed applicable limits, including the MPCA noise limits. Therefore, no mitigation is proposed for the audible noise generated by the proposed Project.

6.2.5 Television and Radio Interference

Corona from transmission line conductors can generate electromagnetic "noise" at the same frequencies that radio and television signals are transmitted. This noise can cause interference with the reception of these signals depending on the frequency and strength of the radio and television signal. Tightening loose hardware on the transmission line usually resolves the problem.

If radio interference from transmission line corona does occur, satisfactory reception from AM radio stations presently providing good reception can be obtained by appropriately modifying (or adding to) the receiving antenna system. Moreover, AM radio frequency interference typically occurs immediately under a transmission line and dissipates rapidly within the right-of-way to either side.

FM radio receivers do not usually pick up interference from transmission lines because:

- corona-generated radio frequency noise currents decrease in magnitude as the frequency increases and are quite small in the FM broadcast band (88-108 Megahertz); and

- the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude-type disturbances.

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel tower) may experience interference. Moving either mobile radio so that the metallic structure is not immediately between the two units should restore communications. This will generally require a movement of less than 50 feet by the mobile radio adjacent to the metallic tower.

Television interference is rare but may occur when a large transmission structure is aligned between the receiver and a weak distant signal, creating a shadow effect. Loose or damaged transmission line hardware may also cause television interference.

Digital reception is, in most cases, considerably more tolerant of electric interference and somewhat less resistant to multipath reflections. In the digital realm, the picture does not gradually degrade; rather, at what is called the "avalanche point," the picture suddenly pixelates (turns into squares) and usually "freezes."

Mitigative Measures

No impacts are anticipated from the proposed Project. However, if radio or television interference occurs because of the transmission line, Xcel Energy will work with the affected parties to restore reception to pre-Project quality. If the interference is due to the power line, the electric utility will remedy problems so that reception is restored to its original quality. Generally, the problem is resolved by moving or raising or adjusting the customer's antenna. In some instances, a more effective antenna or a signal amplifier is required.

6.2.6 Aesthetics

The proposed substation replacement will be within existing Xcel Energy property and the transmission facilities will mainly follow existing BNSF railroad and U.S. Highway 12 rights-of-way. The Project will have some effects on the visual and aesthetic character of the area.

The existing fenced area of the substation site is approximately 0.1 acres. It currently contains an Electrical Equipment Enclosure (EEE) and several pieces of electrical equipment, which are mainly metal. The existing substation site is somewhat screened from view by trees and vegetation located along the south and west property borders.

The replacement substation will comprise a new fenced area of approximately 1.2 acres, which will subsume the existing 0.1 acre fenced area. Because the existing substation area will become a part of the new substation site, the elevation of the new substation site will be similar to the existing site. The new substation will contain approximately eight pieces of mainly metal electrical equipment and include a new EEE, and the maximum height of the new equipment will be approximately 13-18 feet above ground surface. The new equipment and fenced area will be located to comply with applicable property line setbacks. During site grading, some vegetation and trees will need to be removed in the substation replacement area to the south and west of the existing fenced area, as well as along the Proposed Route.

Existing GRE transmission line structures at the substation site are wood monopole structures. The proposed structures for the single circuit and double circuit 115kV line will be a single pole design. The single circuit and double circuit structures will be approximately 70 to 90 and 75 to 115 feet tall respectively and will have an average span of 325 feet. A maximum span of 450 feet will be used between the structures, which will still keep the conductor within the right-of-way under blowout conditions. The typical right-of-way required for these types of structures is 75 feet wide. The overall spacing of the poles will be comparable to other Xcel Energy 115 kV transmission structures, which can vary based on soil conditions, engineering requirements and land use constraints.

The finish of the proposed transmission poles will be galvanized steel or self-weathering steel. The existing transmission line structures in this area are wood poles, and some of the existing poles are of H-frame construction. The proposed galvanized or weathering steel poles will give the new transmission line a somewhat cleaner and more modern appearance.

The landscape surrounding the Orono Substation site is gently rolling, lightly wooded or wetland areas with undeveloped or residential parcels and associated county and private access roads, as well as major double lane thoroughfare (U.S. Highway 12), a Metropolitan Council sewer line and the BNSF railroad. While the double circuit line is proposed to be located within existing Xcel Energy property and on HFA land along the BNSF railroad right-of-way, it will be visible to area residents. The visual effect will depend largely on the perceptions of the observers. The visual contrast added by the transmission structures and lines may be perceived as a visual disruption or as points of visual interest. The existing transmission and distribution lines and Orono Substation limit the extent to which the proposed new transmission line and new substation are viewed as a disruption to the area's scenic integrity.

Mitigative Measures

The proposed substation and transmission line will be partially visible by some residents near the Project. However, the proposed substation replacement and transmission route maximizes the use of existing Xcel Energy property, transportation and utility corridors, and avoids residences to the greatest extent practicable. Also, a portion of the Project site contains the visible existing Orono Substation and transmission and distribution lines that result in a visual impact and, therefore, the installation of new transmission facilities associated with the Project will incrementally increase visual impacts. Visual mitigation is also provided by building the substation partially into the

adjacent hillside which will be held back by the installation of a retaining wall along the southwest corner of the graded area. An additional berm with prairie landscaping and trees, suitable to the existing setting, is planned along the western property line for substation screening purposes.

Mitigation is also provided by using double circuit transmission structures which minimizes the number of transmission structures and right-of-way needed for the Project. Replacing the existing wood three-pole Structure 077 with a single pole structure at a new location off of residential property will also mitigate aesthetic impacts. At the new substation site, Xcel Energy will design and construct the new facility to minimize impacts to existing vegetation and trees, as well as provide additional screening, as needed. Xcel Energy will work with landowners to identify concerns related to the proposed substation and transmission line aesthetics.

6.2.7 Socioeconomic Impacts

Census data from 2010 was not fully available at the time this Route Permit Application was prepared. Socioeconomic data was obtained from the 2000 U.S. Census. The average per capita income is $65,825 in the City of Orono (2000) and $28,789 in Hennepin County (2000). Compared to the state or county average, the Project is located in an area that does not contain disproportionately high minority or low-income populations. No disproportionate impacts on minority or low-income populations are anticipated from the Project. Persons living in Hennepin County have a slightly higher median family income when compared with the rest of the state. The percentage of families with income levels below the federal poverty line is approximately 5.0 percent in Hennepin County (2000), which is slightly lower than the state average. Within the City of Orono, the average median family income is higher than that of the rest of the state. The percentage of families below the federal poverty line in the City of Orono is approximately 0.5 percent (2000). Population and economic data from the 2010 and 2000 US Census is provided in **Table 12**.

Table 12
Population and Economic Characteristics of the Project Location

Location	Population	Minority Population (percent)	Caucasian Population (percent)	Per Capita Income (U.S. dollars)	Percentage of Population Below Poverty Level (families)
State of Minnesota	5,303,925	14.7	85.3	23,198	5.1
Hennepin County	1,152,425	25.6	74.4	28,789	5.0
City of Orono	7,437	3.5	96.5	65,825	0.5

* Population characteristics are from the U.S. Census Bureau, 2010 data.
* Economic characteristics are from the U.S. Census Bureau, 2000 data.

Approximately 15 to 25 workers will be needed over 26 weeks to construct the proposed transmission line and substation. During construction, construction crews will spend money locally, thereby providing a small economic benefit to the community.

There will be short-term impacts on community services as a result of construction activity and an influx of contractor employees during construction the Project. Both utility personnel and contractors will be used for construction activities. The communities near the Project should experience short-term positive economic impacts through the use of the hotels, restaurants, and other services by the various workers.

It is not expected that additional permanent jobs will be created by the Project. The construction activities will provide a seasonal influx of additional dollars into the communities during the construction phase, and materials such as concrete may be purchased from local vendors.

Once the Project is operational, its socioeconomic effects are generally positive because it will provide a more stable and reliable supply of electricity, encourage economic development, provide for future growth, and increase the local tax base resulting from the incremental increase in revenues from utility property taxes.

Socioeconomic impacts resulting from the Project will be primarily positive with an influx of wages and expenditures made at local businesses during the Project, increased tax revenue from the value of the Project and increased opportunities for business development from improved reliability.

Mitigative Measures

The proposed Project will not adversely impact socioeconomic factors. Therefore, no mitigative measures are proposed.

6.2.8 Cultural Values

Cultural values are the history and beliefs of the area that provide a framework for community unity. The region surrounding the Project primarily depends on agricultural practices (typically corn, soybeans, and grazing), with some manufacturing and tourism, as well as educational and residential uses. Local community ties relate to work, worship, celebration, and recreation. Based on the City of Orono's website, examples of area culture and industry include the Corn Days Festival and farmer's markets in Long Lake and Maple Plain. Construction of the proposed Project is not expected to conflict with the cultural values along the route. No impacts on cultural values are anticipated.

Mitigative Measures

The proposed Project avoids or minimizes land uses associated with cultural values and no impacts are anticipated. Therefore, no mitigative measures are proposed.

6.2.9 Recreation

There is one formal recreational area located north of the Project. Baker Park Reserve, which is part of the Three Rivers Park District is located within the boundaries of the City of Orono and the City of Medina and encompasses 2,700 acres (*see* **Appendix B-7**). The south end of Baker Park Reserve lies north of and across the BNSF railroad, the Metropolitan Council sewer line and U.S. Highway 12 from the proposed transmission line route. The new substation should not be visible from Baker Park Reserve and from U.S. Highway 12 due to the distance between these areas and the substation site, plus the higher elevation of the BNSF railroad when compared to the substation site, U.S. Highway 12 and the park.

Baker Park Reserve has many activities available for park users including; biking, boating, camping, canoeing, cross-country skiing, dog trails, fishing, geocaching, golfing, hiking, horseback riding, mountain biking, picnic and play areas, sledding, snowshoeing and swimming. The park wholly contains Spurzem Lake, Half Moon Lake and Lake Katrina and borders the southwest portion of

Lake Independence. The Project is not expected to impact Baker Park Reserve because the Proposed Route remains entirely south of the BNSF railroad and U.S. Highway 12.

Three recreational parks owned by the City of Orono (Bederwoods Park, Lowry Woods Nature Area and Lurton Park) lie between 0.5 miles to just over one mile from the Project Area. Bederwoods Park is located approximately 1.15 miles south east of the Project. It is 8 acres in size and includes a baseball field, swing-set, climber, slide and bike rack. Lowry Woods Nature Area which is located approximately 0.9 miles south of the Project is a 15 acre parcel of "Big Woods" and consists of 100-year-old Red-Oak, Sugar Maple, Ash and Hickory trees. The distance between the Project and Bederwoods Park and Lowry Woods Nature Area along with topography, forested areas, and residential areas is significant enough that visual impacts from the Project will not occur. Likewise, the distance, topography and forested areas between the Project and these parks will be significant enough that audible impacts from construction of the Project will not occur at these locations.

The third park (Lurton Park) is a 39 acre parcel located approximately ½ mile east of the Project. Lurton Park was donated to the City for use as a passive and natural environmental park. Visual impacts from the Project to this park are unlikely due to the elevation of the County Road 6 overpass of U.S. Highway 12. However, due to the close proximity of Lurton Park to the Project there is a potential that temporary audible impacts could occur during the construction of the Project. A portion on the south side of this park was recently purchased by the Minnesota Department of Transportation ("MnDOT") for the construction of the U.S. Highway 12 bypass project.

Mitigative Measures

The proposed Project will not directly affect recreational areas. The Project has been routed to avoid impacts to Baker Park Reserve to minimize impacts to parks and recreation. Therefore, no mitigative measures are proposed.

6.2.10 Public Services

Public services within the vicinity of the Project include sewer, water and transportation. In the City of Orono, water and sewer services are provided by city-owned wells and wastewater treatment facilities. As the Project lies at the edge of the Twin Cities metropolitan area, water in nearby areas outside of the City is obtained from private wells as well as neighboring cities. Likewise, wastewater in surrounding areas is treated with individual septic treatment systems or neighboring cities. The Metropolitan Council forcemain interceptor 8352, which is a 12-inch outside diameter ductile iron pipe, is buried between the BNSF railroad line and U.S. Highway 12 north of the Project (*see* Section 8.1.8 regarding Metropolitan Council response to the Project).

The U.S. Highway 12 Bypass project adjacent to and north of the Project has been completed and no additional work to this project is known at this time. U.S. Highway 12 is a high volume traffic corridor providing access to the Twin Cities Metropolitan area freeway system for the suburbs and rural areas west of the metropolitan area. U.S. Highway 12 reduces from a divided four lane highway to an undivided two lane road just west of the County Road 6 overpass and on the north side of the Project. County Road 6 borders the south and east edges of the area of the Project. Additionally, local city and township roads traverse the area around the Project.

An active BNSF railroad line is located north of the Project. While no direct impacts from the Project are expected to the BNSF railroad, the Proposed Route includes placement of new transmission structures approximately five feet from railroad right-of-way. Xcel Energy is discussing sharing of railroad right-of-way for transmission line overhang with BNSF.

Except for the existing transmission Line 0831 crossing U.S. Highway 12, the Metropolitan Council forcemain, and the BNSF railroad line, the Proposed Route avoids these services. At this time no current or future transportation or utility corridor projects are known to exist.

Mitigative Measures

With the exception of existing Line 0831 crossing U.S. Highway 12, Metropolitan Council forcemain and BNSF railroad, the proposed Project will not directly affect public services. The proposed new 115 kV transmission line will not cross the BNSF railroad, U.S. Highway 12, County Road 6 or other local roads, thus no disruptions to these transportation corridors are expected. Construction related vehicles will utilize U.S. Highway 12 and County Road 6; however, any increase in traffic is expected to be minor. Therefore, no mitigative measures are proposed.

6.3 Land-Based Economics

6.3.1 Agriculture

Hennepin County has strong economic ties to agricultural production. According to the 2007 United States Department of Agriculture ("USDA") Census of Agriculture, Hennepin County has 582 individual farms, marking a 7% decrease in total number of farms over the previous five years. Agricultural lands cover 66,558 acres, representing approximately 73% of all lands in Hennepin County with an average farm size of 114 acres. Hennepin County ranks among the top 20 counties in nursery, greenhouse, floriculture and sod (ranking 3rd statewide) land uses; and horses, ponies, mules, burros and donkeys (ranking 3rd Statewide). Over $51 million was generated from both crop and livestock sales in 2007.

While Hennepin County is primarily agricultural, the entire Project site and proposed transmission route is located outside of actively cultivated tracts. As discussed in Section 6.2.2, the nearest farmstead is located 1/2 mile south of the Project. Construction activities associated with the proposed Project are not located within or near any farm lands.

Mitigative Measures

No impacts to agriculture anticipated from the Project. Therefore, no mitigative measures are proposed.

6.3.2 Forestry

There are no forested areas where tree species are harvested along the proposed transmission line route or the Orono Substation replacement site. The primary tree cover in the area is associated with waterways, homesteads and Baker Park Reserve. No economically significant forestry resources are located along the proposed transmission line route or at the Orono Substation site.

Mitigative Measures

No forest or commercial logging impacts from the Project are expected. Therefore, no mitigative measures are proposed.

6.3.3 Tourism

Primary tourism activities in the region include camping, recreational use of the regions lakes for fishing and boating, bicycling, cross country skiing and hunting on private lands. The Baker Park Reserve is the only park in the immediate area of the Project that could be considered a tourist area. However, the proposed Project does not cross any lands owned or used by the park (see **Figures B.2** and **B.7** in **Appendix B**). Besides Baker Park Reserve, areas west and north of the Project are primarily rural residential and agricultural. Areas south and east of the Project are primarily rural and urban residential.

Mitigative Measures

No effects on tourism are anticipated from the Project. Therefore, no mitigative measures are proposed.

6.3.4 Mining

According to MnDOT county pit maps for Hennepin County, there is one inactive gravel pit located approximately four miles east of the Project site. Because no existing gravel and rock resources are being utilized within or near the Project site or proposed transmission line route, no impacts are anticipated. Unknown resources that may exist near the Project would be situated in close proximity to existing transportation rights-of-way, making development of mining resources unlikely.

Mitigative Measures

No effects on mining are expected from the Project. Therefore, no mitigative measures are proposed.

6.4 Archaeological and Historic Resources

In response to an Xcel Energy request for comment, the Minnesota State Historic Preservation Office ("SHPO") commented on the proposed Project in a letter dated October 21, 2010 (*see* **Appendix C.7**). The SHPO requested that an archaeological survey for the Project be completed prior to the beginning of construction activities.

To further assess the potential for archaeological and historic resources to be present near the Project, Xcel Energy engaged URS Corporation ("URS") to conduct a Phase Ia background research/literature review for the proposed Project and prepared a Phase Ia Report. A copy of the Phase 1a Report has been included with this Application as **Appendix E.** Portions of the Phase Ia report have been omitted due to information considered confidential and not readily available to the general public. URS reviewed previously recorded cultural resource properties at the SHPO. In addition, historical maps, historic aerial photographs, and additional online resources were used to review the recent cultural and environmental history of Project site.

The Phase Ia background research revealed that no archaeological site or inventoried standing structure is recorded within the proposed Project. A total of 34 previously recorded cultural resource properties were located within the proposed Project Area. The site file search identified 15 archaeological sites and 19 inventoried historic architectural properties located within one mile of the Project. The Phase Ia Report in **Appendix E** provides more information on these sites.

Of the 15 archaeological sites, thirteen are pre-contact and consist of: six lithic scatters, two artifact scatters, three single artifact finds, and two Native American earthwork. The remaining two sites consist of post-contact historic structural ruins with associated artifact scatters. None of the previously recorded artifact scatters are listed in the National Register CEF by the SHPO. Of the 19 historic architectural properties none are listed on the National Register of Historic Places ("NRHP") or CEF.

Based upon these findings, the potential for the Project to impact any undiscovered archaeological site is low because the Project is proposed to be located at the existing Orono Substation site, and along existing transportation corridors or it is located in areas already disturbed by residential and commercial development. However, the URS archaeologist identified one area of concern at the proposed Orono Substation replacement site. The Phase Ia Report recommends that archaeological field surveys be initiated in areas previously undisturbed prior to construction at the Orono Substation replacement site.

On April 13, 2011, Xcel Energy submitted a consultation letter with a copy of the Phase Ia Report to the SHPO requesting SHPO written agreement with the Phase Ia Report findings and recommendations for the Project. The SHPO responded by letter on May 12, 2011, and concurred with the conclusions and recommendations of the Phase Ia Report (*see* **Appendix E**). The SHPO indicated that a full field survey needs to be performed at two locations within the Project area. Xcel Energy will continue to work with the Minnesota SHPO to determine the appropriate next steps for the Project.

Mitigative Measures

As determined in the Phase Ia Report, no property listed or eligible for listing on the NRHP or the Minnesota Register of Historic Sites is located at or near the Project. However, several previously recorded cultural resource properties were located within one mile of the proposed Project area, and surveys are recommended for specific previously undisturbed Project locations. Xcel Energy implement the SHPO recommendations and will continue to work with the SHPO regarding possible impacts from the Project.

If there is an unanticipated discovery of cultural resources during Project construction, Xcel Energy will stop construction activities and consult with a professional archaeologist and the Minnesota SHPO to determine the proper course of action. If a cultural item or feature is determined to be potentially eligible for listing on the NRHP, it will be avoided or mitigated before construction resumes.

6.5 Natural Environment

6.5.1 Air Quality

Potential air quality effects related to transmission facilities include fugitive dust emissions during construction, exhaust emissions from construction equipment, and ozone generation during

transmission line operation (Jackson et al., 1994). All of these potential effects are considered to be relatively minor, and all but the ozone effects are short-term.

State and federal governments currently regulate permissible concentrations of ozone and nitrogen oxides. Ozone forms in the atmosphere when nitrogen oxides and volatile organic compounds react in the presence of heat and sunlight. Air pollution from cars, trucks, power plants, and solvents contribute to the concentration of ground-level ozone through these reactions. Currently, both state and federal governments regulate permissible concentrations of ozone and nitrogen oxides. The national standard is 0.075 parts per million ("ppm") during an 8-hour averaging period. The state standard is 0.08 ppm based upon the fourth-highest 8-hour daily maximum average in one year.

The only potential air emissions from a transmission line result from corona, and such emissions are limited. Corona consists of the breakdown or ionization of air within a few centimeters immediately surrounding conductors and can produce ozone and oxides of nitrogen in the air surrounding the conductor. This process is limited because the conductor electrical gradient of a 115 kV transmission line is usually less than that necessary for the air to break down. Typically, some imperfection such as a scratch on the conductor or a water droplet is necessary to cause corona.

Ozone is not only produced by corona, but also forms naturally in the lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants such as hydrocarbons from auto emissions. The natural production rate of ozone is directly proportional to temperature and sunlight and inversely proportional to humidity. Thus, humidity (or moisture), the same factor that increases corona discharges from transmission lines, inhibits the production of ozone. Ozone is a reactive form of oxygen and combines readily with other elements and compounds in the atmosphere. Because of its reactivity, it is relatively short-lived. There are currently no non-attainment areas designated in Minnesota (U.S. Environmental Protection Agency, 2010).

During construction of the proposed transmission line, minor emissions from vehicles and other construction equipment and fugitive dust from right-of-way clearing will occur, but will be limited. Air-quality impacts during the construction phase will also be temporary.

The magnitude of construction emissions is heavily influenced by weather conditions and the specific construction activity. Exhaust emissions, primarily from diesel equipment, will vary according to the phase of construction, but will be minimal and temporary. Adverse impacts on the surrounding environment will be minimal because of the short and intermittent nature of the emission and dust-producing construction phases.

Mitigative Measures

Xcel Energy will employ BMPs to minimize the amount of fugitive dust created by the construction process. Tracking control at access roads and wetting surfaces are examples of BMPs that will be used to minimize fugitive dust. Based upon this, Xcel Energy anticipates no significant effects to air quality from the Project; therefore, no additional mitigative measures are proposed.

6.5.2 Water Quality

The water resources located within the Project are identified in **Appendix B-6** (*see also* **Table 4**). Although areas of the Project, such as a portion of the Orono Substation site, have a greater elevation

than the surrounding wetland areas, the entire Project is located within the 100-year floodplain (FEMA, 1994), and within the Minnehaha Creek Watershed District ("MCWD").

The MnDNR Public Waters Inventory ("PWI") identifies lakes, wetlands, and watercourses over which the MnDNR has regulatory jurisdiction. The statutory definition "public waters" and "public waters wetlands" can be found in Minn. Stat. § 103G.005, subd. 15 and 15a. A MnDNR License for utility to Cross Protected Waters is required for designated PWI crossings. Two wetland areas are crossed by the Project (*see* **Appendix B-6**) which are designated as "unnamed (27-916 W)" and "unnamed (27-917 W), and require a MnDNR license. (MnDNR, 2010d). These are discussed below in Section 6.5.3.

Potential groundwater impacts associated with overhead electric transmission lines are typically associated with the construction of the lines and structure placement. Examples of potential impacts include the clearing of rights-of-way leading to erosion into nearby streams and wetlands, vibrations from construction equipment resulting in sedimentation being released into shallow aquifers and the drilling of foundations for towers into shallow aquifers. Groundwater impacts are not anticipated during the construction of the Project. Aquifers in the area of the Project are not typically considered to be shallow in nature, therefore, sedimentation as a result of construction activities is not expected to occur.

Potential impacts on water quality resulting from ground disturbance (e.g., excavating, grading and traffic) are limited to the construction phase of the Project substation replacement and new transmission structures and lines, when sediment could possibly reach surface waters.

Mitigative Measures

No significant impacts to water quality are anticipated from the Project. Xcel Energy will apply erosion control measures and BMPs to minimize the potential for discharge to surface waters. Implementation of BMPs to prevent water quality impacts and the construction, restoration, and maintenance of the transmission line are discussed in Sections 5.1.4, 5.1.5 and 5.1.6. A National Pollutant Discharge Elimination System ("NPDES") stormwater permit will identify additional mitigation measures, if necessary. In addition, standard erosion control measures identified in the MPCA Stormwater BMP Manual will be followed.

During construction, Xcel Energy will control construction activities to minimize and prevent material discharge to surface waters and groundwater. If materials do enter surface waters or groundwater, they will be promptly removed and properly disposed of to the extent feasible. Disturbed surface soils will be stabilized at the completion of the construction process to minimize the potential for subsequent effects on surface water and groundwater quality.

6.5.3 Wetlands

Large wetland complexes and small isolated wetlands are located in and around the Project site. A summary of wetlands within and near the Project is located in **Table 13** and shown in **Appendix B-6**. Some of these wetlands are adjacent to the various lakes that lie near the proposed Project.

For the proposed transmission line off of Xcel Energy property, the U.S. Fish and Wildlife Service ("USFWS") National Wetlands Inventory ("NWI") was reviewed to assess which wetlands may be present within the requested transmission line route width for the Project (*see* **Appendix B-6**). The

NWI has not been field verified for a portion of the Proposed Route off of Xcel Energy property, and sometimes contains inaccuracies. However, it is a good tool for initial wetland identification and assessment.

Xcel Energy engaged Westwood Professional Services, Inc. ("Westwood") to perform a wetland delineation of the 16 acre Orono Substation site and prepared a Wetland Delineation Report (dated July 2, 2010). The wetland area within the 16 acre site was identified as a type 3 Palustrine Emergent ("PEM") (Shallow Marsh) wetland. Additionally this wetland is classified as seasonally flooded, partially drained/ditched ("PEMCd"). The dominate vegetation within the wetland consisted of cattail and reed canary grass, with lesser amounts of Box Elder. The vegetation within the upland areas of the site transitioned from hydrophytic vegetation in the wetland areas to non-hydrophytic vegetation in the upland areas. Westwood prepared the Wetland Delineation Report (dated July 2, 2010); Xcel Energy submitted the Wetland Delineation Report to the Minnehaha Creek Watershed District ("MCWD") on August 4, 2010; the MCWD issued a Notice of Application for the delineation and requested comments on August 10, 2010; and the MCWD issued a Notice of Decision accepting the wetland delineation on September 14, 2010. The Wetland Delineation Report can be found in **Appendix F** along with the Minnesota Wetland Conservation Act ("WCA"), Notice of Decision (dated September 14, 2010) by the MWCD.

In total, two wetlands were identified within the 400 foot wide route width for the proposed transmission line (*see* **Appendix B-6**). One additional wetland was identified just outside of the 400 foot wide route width. Overall, the 400 foot transmission line corridor extends approximately 3,136 feet and encompasses approximately 28.8 acres, of which approximately 13.63 acres (47%) are wetlands. Approximately 3.29 acres of the 75 foot right-of-way required for the transmission line are wetlands. Based upon preliminary structure locations and design spans nine transmission structures will be necessary for the proposed Project. It is estimated that five or six of these structures will fall within or on the edge of wetlands (*see* **Appendix B-2 and B-6**).

The wetland present within the Proposed Route is classified as a Palustrine type wetland. Other wetlands near the Project site are also Palustrine type wetlands. The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens (Cowardin et al**.** 1979).

Vegetation within the wetland crossed on the 16 acre Orono Substation site consists of emergent vegetation with a mixture of grasses, cattail, shrubs and herbaceous vegetation (see Wetland Delineation Report in **Appendix F**). The wetland present on the Orono Substation site is a large portion of PWI unnamed (27-916 W) crossed by the Project. The other PWI unnamed (27-917 W) crossed by the Project appears to have once been connected to unnamed (27-916 W) and likely will be of similar make up. Both of these wetlands are identified as public water wetlands (MnDNR 2010d). However, human impact in the form of residential development has since separated these two wetlands for construction of a road within the HFA.

The proposed Project will have minor, mostly short term effects on surface water resources and associated wetlands. Most potential effects on surface waters and wetlands will be related to construction of the proposed transmission line across the existing wetlands. The Project may require wetland and water resource approvals from the U.S. Army Corps of Engineers ("USACE"), MnDNR, Hennepin County and the MWCD. USACE administers the federal Clean Water Act and Rivers and Harbors Act. A license from the MnDNR is required to cross public water wetlands.

Appendix B-6 shows wetland locations and **Table 13** summarizes the wetlands located within the 75-foot-wide easement and 400-foot-wide corridor width associated with the Proposed Route.

Table 13
Wetlands within the Proposed Route

Township	Range	Section	Wetland Type [a]	Wetland Area (acres)
Wetlands Within 75-foot-wide Easement				
118	23	29	PEM	0.44
118	23	30	PEM	2.85
			Subtotal	3.29
Wetlands Within 400-foot-wide Route Width				
118	23	29	PEM	2.15
118	23	30	PEM	11.48
			Subtotal	13.63

[a] Based on the USFWS - Cowardin Classification System for wetlands. Wetland types include: PEM – (Palustrine Emergent).

Approximately 3.29 acres of wetlands are located within the 75-foot wide easement area and 13.63 acres of wetlands are located within the 400 foot wide route width of the Proposed Route. Because the proposed transmission line easement will be 75 feet wide, potential permanent impacts to wetlands will be limited to the areas where structures will be located and operated, as well as removal of vegetation for construction and operation of the overhead transmission line. Therefore, permanent wetland impacts are anticipated to be much less than the wetland areas indicated in **Table 13**, and a minimal amount of wetland conversion is expected for the Project. Temporary impacts from construction vehicles and equipment would occur in the areas needed to access the transmission structure locations for construction. The final locations of the transmission structures has yet to be determined.

Similar to the Proposed Route, the USFWS' Cowardin System classifies the majority of wetlands affected by Alternative Routes 1, 2, 3 and 4 as Palustrine Emergent Seasonally Flooded or wet meadows. Approximately 2.05 acres of wetlands are located within the 75-foot wide easement area of Alternative Route 1, approximately 1.26 acres for Alternative Route 2, approximately 2.05 acres for Alternative Route 3 and approximately 4.08 acres for Alternative Route 4. For similar reasons noted above, wetland impacts within the Alternative Routes are expected to be much less than the area of wetlands located within the easement area.

Wetlands crossed by the Proposed and Alternative Routes may be jurisdictional to the USACE under Section 404 of the Clean Water Act. Once the route is finalized and permitting requirements determined, Xcel Energy will submit the Minnesota Local/State/Federal Application Form for Water/Wetland Projects to the USACE's St. Paul District, MnDNR, and Hennepin County Soil and Water Conservation District ("SWCD"), if needed. Xcel Energy anticipates the Project will be authorized, if needed, under the USACE's General Permit ("GP")/Letter of Permission ("LOP") permitting program. Application materials will include information necessary for the USACE to make its jurisdictional determination for impacted wetlands. The joint application will also be subject to MnDNR, Hennepin County SWCD and MCWD review and regulation under the Minnesota Wetland Conservation Act.

According to the Clean Water Act, Section 401 water quality certification is required for activities that may result in a discharge to waters of the United States. On non-tribal lands in Minnesota, such as the Orono Substation site and Proposed Route, the MPCA administers Section 401 water quality certification. If the USACE authorizes the Project under its GP/LOP permitting program as expected, the MPCA waives its Section 401 Water Quality Certification authority.

Although the Orono Substation, and to a lesser degree the surrounding residential lots, have a greater elevation than the wetland areas, the entire Project is located within the 100-year floodplain (FEMA, 1994) and is designated as Zone A. The 100-year floodplain maps indicate areas with a one percent chance of being inundated by water in any given year. The Zone A designation for this area means that no flood base elevations have been designated. The crossing of the 100-year floodplain occurs in upland areas as well as wetland areas. Although the Orono Substation and first 410 feet of proposed transmission line leaving the substation site is located within the 100-year floodplain, the elevation (983) of this area is much greater than the surrounding wetlands areas (964).

Mitigative Measures

Xcel Energy will obtain a MnDNR License for Utility to Cross Protected Waters from the MnDNR Division of Waters because the proposed transmission line passes over, and across wetlands designated as state public waters (unnamed 27-916 W and 27-917 W), under Minn. Stat. § 84.415. This license will include specific requirements for the PWI crossing. In addition to implementation of storm water BMPs and the Stormwater Pollution Prevention Plan ("SWPPP") during construction, Xcel Energy will implement the requirements of the MnDNR license to cross the PWIs.

In addition to the wetland delineation that was conducted at the existing Orono Substation site, Xcel Energy will conduct wetland delineation of the Proposed Route for the new transmission line. During construction, the most effective way to minimize impacts on wetland areas will be to span wetlands to the extent possible. In addition, crossing wetlands with equipment will be avoided except where necessary. Where wetlands must be crossed to pull in the new conductors and shield wires, workers may be required to walk or drive equipment across ice in the winter. These construction practices will help prevent soil erosion and ensure that construction vehicles and equipment fueling and lubricating will occur at a distance from wetlands. Xcel Energy will follow standard erosion control measures identified in the MPCA Stormwater BMP Manual, such as using silt fencing to minimize impacts on adjacent water resources.

Impacts on wetlands will be minimized through appropriate construction practices. Construction crews will maintain sound water and soil conservation practices during construction and operation of the facilities to protect topsoil and adjacent water resources and minimize soil erosion. Practices may include containing excavated material, protecting exposed soil, and stabilizing restored soil. Crews will avoid major disturbance of individual wetlands and drainage systems during construction. This will be accomplished by strategically locating new access roads and spanning wetlands and drainage systems where possible.

The Project design will incorporate spacing of structures to span wetlands and streams to the extent possible. However, it is possible that some transmission structures could be placed within wetlands; any necessary permits will be obtained after final design is completed and prior to starting construction.

When it is not feasible to span the wetland, construction crews will use several methods to minimize impacts:

- When possible, construction will be scheduled for when the ground is frozen;
- Crews will attempt to take the shortest route when they access the wetland;
- The structures will be assembled on upland areas before they are brought to the site for installation; and
- When construction during winter is not possible, construction mats will be used where wetlands will be affected.

Xcel Energy will obtain the required permits if waters of the United States, as defined by the USACE, or wetlands, as defined under the Minnesota WCA, are affected.

No impacts to the identified floodplain are anticipated from the Project. However, Xcel Energy will design the Project to avoid and minimize floodplain impacts by siting transmission structures outside of the floodplain and controlling storm water runoff from the replacement substation site, to the extent possible.

6.5.4 Flora

Land use within Hennepin County varies greatly from major metropolitan centers to industrial use, rural residential use and agricultural use. Although the majority of the land within Hennepin County is used for agriculture, the land adjacent to the proposed Project is larger developed residential parcels, undeveloped association land, wetlands or undevelopable park land (*see* **Appendices B-8 and B-9**). Other land uses adjacent to or within the proposed Project include undeveloped open and herbaceous and forest land. Forest lands in the area primarily consist of deciduous forest types (e.g., maple, oak).

On February 17, 2011, Xcel Energy requested that the MnDNR provide Natural History Inventory System ("NHIS") data related to the Project site. In its March 31, 2011 letter, the MnDNR did not identify any rare flora features near the Project location. *See* **Appendix C.1**.

The majority of trees within and near the Project are associated with residential areas and the Baker Park Reserve. In total the requested 400 foot corridor encompasses approximately 28.8 acres, of which trees cover occurs on approximately 2.7 acre. Removal of vegetation and trees and impacts to wetlands will be minimized to the extent possible through detailed Project design, siting of transmission structures and construction methods.

Mitigative Measures

Xcel Energy has selected the Proposed Project Route and design of the proposed Orono Substation replacement within Xcel Energy property to avoid occupied residences, private land and associated trees as much as reasonably possible. In addition, where possible the new transmission line will be located during detailed design and during construction to avoid existing trees. To minimize impacts on trees, only trees located within the transmission line right-of-way, and expanded substation areas, or those trees that will affect the safe operation of the transmission line will be removed. Trees outside the right-of-way that may need to be removed will primarily include trees that are unstable and could potentially fall into the transmission facilities. Xcel Energy will work with landowners to

modify the proposed construction area such that vegetation and tree removal is avoided to the extent possible.

6.5.5 Fauna

Wildlife within the area of the Project consists primarily of deer, small mammals, waterfowl, raptors, and perching birds (MnDNR). These species are typically observed in areas that are primarily open and agricultural, with limited opportunities for nesting and cover. Threatened species and species of concern in near the Project are discussed further in Section 6.6 below.

The land use at and within the vicinity of the proposed Project is predominantly residential or undeveloped wetland. The primary potential impact presented to fauna by transmission lines is the potential injury and death of migratory birds such as raptors, waterfowl, and other large bird species. The electrocution of large birds, such as raptors, is more commonly associated with small distribution lines than large transmission lines. Electrocution occurs when birds with large wingspans come in contact with two conductors or with a conductor and a grounding device. Xcel Energy transmission and distribution line design standards provide adequate spacing to eliminate the risk of raptor electrocution and will minimize potential avian impacts of the proposed Project.

Wildlife could also temporarily be displaced and a small area of habitat could be lost from the Project transmission line right-of-way during construction. Wildlife that inhabits trees that may be removed for the Project, along with wildlife that inhabits other undeveloped areas, will likely be temporarily displaced. Similar tree habitats are found on land adjacent to the Proposed Route; therefore, it is likely that these species will only be displaced a short distance.

In September 2010 and January 2011, Xcel Energy requested comments from MnDNR regarding impacts on wildlife in the vicinity of the Project. In a letter dated March 31, 2011 the MnDNR identified two avian species near the Project location, including Trumpeter Swans and Bald Eagles. Of these species, the Trumpeter Swan has a State status of Threatened and the Bald Eagle has a State status of Special Concern. *See* Sections 6.6 and 8.1.6 and **Appendix C.1** for more information regarding this correspondence.

Mitigative Measures

Displacement of fauna is anticipated to be minor and temporary in nature, and no long-term population-level effects are anticipated. Xcel Energy has been working with various state and federal agencies over the past 20 years to address avian issues as quickly and efficiently as possible. In 2002, Xcel Energy entered into a voluntary Memorandum of Understanding ("MOU") with the USFWS to work together to address avian issues throughout its service territories. This includes the development of Avian Protection Plans ("APP") for each Upper Midwest state Xcel Energy serves: Minnesota, South Dakota, and North Dakota.

The primary methods Xcel Energy uses to address avian issues for transmission projects include:

- working with resource agencies to identify any areas that may require marking transmission line shield wires or using alternate structures to reduce collisions (resource agencies include the MnDNR, USFWS, and the USACE); and

- attempting to avoid areas known as major flyways or migratory resting spots.

Xcel Energy's transmission line design standards provide adequate spacing to eliminate such risks, so it is unlikely that any birds will be electrocuted as a result of the proposed Project.

In addition to the mitigation Xcel Energy proposes above, the MnDNR recommends two measures to avoid impacts on rare features within the Project site (MnDNR) (*see* **Appendix C.1**). These recommended MnDNR measures include the following:

- due to the documented presence of Trumpeter Swans, a state-listed threatened species, in close proximity to the proposed Project, use of bird diverters on overhead lines near lakes and rivers, or other areas that may attract large concentrations of waterfowl; and

- discuss in the Route Permit Application if the proposed Project has the potential to adversely affect the Trumpeter Swan and, if so, any avoidance or mitigation measures that will be implemented.

Avian collisions are possible in areas where agricultural fields serve as feeding areas, as well as in wetlands and on open water. However, the Project site is not located near agricultural fields but is located near many existing transportation and utility corridors, as well as other infrastructure (e.g. residences). Therefore, these species are likely already acclimatized to human development. Xcel Energy is working with the MnDNR Regional Environmental Assessment Ecologist to determine appropriate and applicable mitigation measures to address these concerns regarding the Project.

Mitigation measures specific to those species identified by the MnDNR as threatened or species of concern are also discussed in Section 6.6.

6.6 Rare and Unique Natural Resources

A request for a MnDNR NHIS search and comments regarding rare species and natural communities for the Project was submitted to the MnDNR on February 17, 2011. The results of the MnDNR NHIS response dated March 31, 2011 are included in **Appendix C.1**. The following assessment is based on MnDNR response, a review of the Natural Heritage Database that is licensed to Xcel Energy by the MnDNR, and other state and federal rare species and natural community information.

The MnDNR NHIS database was queried to obtain the locations of rare and unique natural resources across the Project Site. Queries to the NHIS database often display species that either do not have a status or are of special concern (referred to as "SPC" in the tables below). Species or communities that do not have a status, or are classified as special concern, have no legal protection in Minnesota. Only potential impacts on non-aquatic species with legal protection (threatened and endangered) are discussed below.

Within one mile of the proposed Project routes, the NHIS database identified one rare and unique species. *See* **Appendix C.1**. The identified species included the Trumpeter Swan. The Trumpeter Swan is listed as threatened at the state level. The Trumpeter Swan is typically found in shallow marshes and lakes. Additionally, the NHIS database identified one additional species (Bald Eagle), one animal assemblage (Colonial Waterbird Nesting Area), one vascular plant (American Ginseng) and two native plant communities (Undetermined Class and Red Oak-Sugar Maple-Basswood Forest Type). Although the NHIS database identified these additional resources they have a State listing status of either special concern or N/A. Due to their State status these additional resources

have no legal protection in Minnesota. **Table 14** summarizes the species found, their habitats, and their state status for the proposed Project.

Table 14
Rare and Unique Resources Near the Proposed Project

Common Name	Scientific Name	Number of Occurrences	Most Recent Occurrence	MN Status[a]	State Rank [a]	Habitat
Species						
Trumpeter Swan	*Cygnus buccinators*	Not provided by NHIS response	2009	THR	S2B	Shallow Marshes, and Lakes
Bald Eagle	*Haliaeetus leucocephalus*	Not provided by NHIS response	2005	SPC	S3B, S3N	Near rivers, large lakes and other areas of large open water
American Ginseng	*Panax quinquefolius*	Not provided by NHIS response	1995	SPC	S3	Rich hardwood forests
Animal Assemblage						
Colonial Waterbird Nesting Site	NA	Not provided by NHIS response	1998	N/A	SNR	NA
Native Plant Community						
Native Plant Community, Undetermined Class	NA	Not provided by NHIS response	1995	N/A	SNR	NA
Red Oak-Sugar Maple-Basswood Forest Type	NA	Not provided by NHIS response	1988	N/A	S2	NA

[a] At the state level, "THR" refers to species listed as threatened, "SPC" refers to species of special concern, and "N/A" refers to native plant communities, geological features, and/or colonial waterbird nesting sites that have no legal status. In addition, Minnesota also assigns a rank to listed species. This rank reflects the known extent and condition of that species. Ranks range from S1 (in greatest need of conservation action in the state) to S5 (secure under present conditions), and SNR (rank not yet assessed).

Wetlands will be avoided to the extent possible as discussed above in Section 6.5.3 and the nearest lake (Katrina Lake) is approximately 1,000 feet north from its nearest point to the Proposed Route. Therefore, the Trumpeter Swan is unlikely to be affected.

Since the Proposed Route and the Alternative Routes are all within a relatively short distance from each other it has been assumed that the NHIS database would be similar for the Proposed and Alternative Routes. *See* **Appendix G-4**.

Mitigative Measures

To mitigate potential impacts on species occupying wetland communities, structures and poles will be placed so that the conductor spans waterbodies, watercourses, and wetlands to the extent possible. Sediment will be controlled so that it does not reach aquatic and wetland habitats.

To prevent impacts on the Trumpeter Swan, to the extent possible and applicable, Xcel Energy intends to adopt the mitigation measures recommended by the MnDNR (*see* **Appendix C.1**), and Xcel Energy will continue to work with the MnDNR to appropriately implement such measures.

7.0 COMPARISON OF THE PROPOSED AND ALTERNATIVE ROUTES

The extent of the area used to compare the Proposed and Alternative Routes vary depending on the applicable siting factors, including:

i. aesthetics, cultural values, recreation, public services, tourism, electrical system reliability, flora and fauna were identified within the Project location;

ii. rare and unique natural resources and archaeological and historic resources were identified within an approximate one-mile radius of the Project location;

iii. air quality, water quality, route specific design issues and existing infrastructure were identified within the requested 400-foot route width of the Project route centerline;

iv. residences, noise, or public health and safety were identified within 200 feet of the Project route centerline; and

v. wetlands, floodplains, and flora were identified within the 75-foot-wide easement width or the Proposed Route.

For each siting factor, the potential effect of the each route is briefly summarized or it was determined there was no effect for the factor.

There are no anticipated effects for several siting factors including: noise, displacement of residents, cultural values, tourism, public services, infrastructure, public health and safety, forestry, air quality, water quality, public water crossings, mining, electrical system reliability, agriculture and loss of prime farmland. For other siting factors, the effects for the Proposed and Alternative Routes are similar, including: archaeological resources, historic resources, floodplains, flora, fauna, rare and unique resources, and forested areas.

Table G.2 in **Appendix G** summarizes Xcel Energy's application of the factors set forth in Minn. R. 7850.4100 for the Proposed and Alternative Routes. In general, in comparison to the Alternative Routes, the Proposed Route has no impacts on these factors, less impacts on these factors or similar impacts to these factors than the Alternative Routes.

The primary differences between the Proposed Route and the Alternative Routes are the effects on the following siting factors: recreation, existing rights-of-way, and wetland crossings. Based on this analysis, the Proposed Route has fewer impacts compared to the Alternative Routes as follows:

- The Proposed and Alternative Routes generally cross the same type of landscape in a predominantly undeveloped open setting. To minimize impacts on these land uses, the Proposed Route parallels the BNSF railroad right-of-way for 57 percent of the route, while Alternative Routes 1, 2, 3 and 4 follow existing road or railroad right-of-way for 37, 43, 44, and 0 percent of their routes, respectively. Alternative Route 4 follows an existing GRE transmission right-of-way for approximately 3,130 feet (84 percent) of this route;

- The Proposed Route will cross approximately 2,140 lineal feet of wetland. Alternative Routes 1, 2, 3 and 4 will cross approximately 1,760, 750, 1,760 and 2,370 lineal feet of

wetland, respectively. The Proposed Route will affect approximately 2 acres more of wetlands than Alternative Route 2 assuming a 75-foot-wide route width in each route;

- Except for replacing existing transmission Structure 076 which is located within existing right-of-way on Baker Park Reserve property, the Proposed Route is outside of the Baker Park Reserve property. Three of the four Alternative Routes enter the Baker Park Reserve Property and would require new right-of-way, creating new impacts;

- Except for the existing Line 0831 conductors, the Proposed Route does not cross the BNSF railroad, U.S. Highway 12 or the Metropolitan Council's sewer line, however three of the four Alternative Routes cross these infrastructures; and

- Xcel Energy is in discussions with two private landowners to move the portion of existing Line 0831, that is on their respective residential properties, north onto HFA land. Relocating this portion of Line 0831 is only associated with the Proposed Route. None of the Alternative Routes would relocate existing transmission facilities off residential property.

8.0 AGENCY INVOLVEMENT, PUBLIC PARTICIPATION, AND REQUIRED PERMITS AND APPROVALS

8.1 Agency Contacts and Response

8.1.1 Notice to Local Government Units

Xcel Energy provided a notification letter to the City of Orono, the LGU for the Project on January 10, 2011. *See* **Appendix C.2**. This letter indicated that Xcel Energy intended to apply for a Route Permit for the proposed Project from the Commission. The notification letter to the LGU complies with the notice requirements of Minn. Stat. § 216E.03, subd. 3a. Xcel Energy has not to date received response regarding the Project from the City of Orono after this notification.

As discussed in Section 4.2.2, Xcel Energy initially sought local review of the proposed Project from the City. The City subsequently voted to refer review and permitting of the routing and siting of the Project to the Commission pursuant to Minn. Stat. 216E.05, subd. 1(b), and MN Rule 7850.5300 subp. 4 (*see* **Appendix C, C.3**). Xcel Energy then initiated the State permitting process for the Project.

Xcel Energy has had an opportunity to meet with the City and other LGUs during meetings conducted in June and August 2010. These meetings are discussed further in Section 8.3.

8.1.2 Notice to Other Agencies and Interested Parties

Xcel Energy also provided notice of the Project and requested comments in a letter on January 10, 2011, to several non-LGU, agencies and interested parties associated with the Project. The purpose of the letter was to provide notice of Xcel Energy's plan to obtain a Route Permit from the Commission and request for comments on the proposed Project. *See* **Appendix C.2** for the non-LGU mailing list and a copy of this letter.

8.1.3 Natural Resource Conservation Service

In a letter dated January 20, 2011, the NRCS Environmental Review and Justice Program indicated that since the Project sponsors are not USDA program benefit recipients the wetland conservation provisions of the 1985 Food Security act are not applicable to the Project (*see* **Appendix C.4**)

8.1.4 United States Fish and Wildlife Service

In an email dated February 8, 2011, the USFWS indicated that no Federally listed or proposed species and /or designated or proposed critical habitat is present within the action area of the proposed Project. The USFWS did recommend that given the proximity to the Baker Park Reserve and the crossing of the wetland between the proposed Orono Substation replacement and the BNSF railroad right-of-way that bird flight diverters be installed on the shield wire of the proposed transmission line crossing this wetland. Additionally, the USFWS did recommend that if any maintenance work were to take place on the existing transmission Line 0831 within the Baker Park Reserve that bird flight diverters also be placed on the shield wire of the transmission line for the portion that crosses the Baker Park Reserve. (*See* **Appendix C.5**).

8.1.5 Minnesota Department of Transportation

In a letter dated October 14, 2010, the Minnesota Department of Transportation ("MnDOT") indicated that the proposed location of the new 115 kV transmission line would be an improvement over the existing 69 kV GRE Line BD location, which it indicated would be removed, and that MnDOT does not have any concerns with the scope of the Environmental Assessment for the Project2. (*See* **Appendix C.6**). It should be noted that MnDOT misunderstood that the existing GRE 69 kV transmission line is to be disconnected from the existing Orono Substation, that it will not be connected to the replacement substation, and that GRE will re-route this line around the replacement substation. Xcel Energy will discuss this misunderstanding with MnDOT.

8.1.6 Minnesota Department of Natural Resources

Xcel Energy submitted two formal consultations to the MnDNR in letter form requesting comments on the proposed Project. The first letter was sent to the MnDNR in September of 2010 and the second letter was sent in January of 2011. At this time, no response from the MnDNR Regional Environmental Assessment Ecological contact has been received for the Project. Xcel Energy also requested a review of the Minnesota NHIS on February 17, 2011, to determine if rare plants, animals, and natural communities or other significant natural features are known to occur within the Project Area (*see* also Section 6.6 above and **Appendix C.1**).

On March 31, 2011, the MnDNR provided the Natural Heritage Review for the Project. The MnDNR identified one rare and unique species, within approximately one mile of the Project. (*see* **Appendix C.1**). As discussed in Section 6.6, the species includes the Trumpeter Swan. The Trumpeter Swan is typically found in shallow marshes and lakes. As discussed in Section 6.5.6, the MnDNR indicated that no rare or unique flora related resources with State protection were present within one mile of the proposed Project.

Xcel Energy is currently working with the MnDNR to determine appropriate and applicable mitigation measures (*see* Sections 6.5.6, 6.5.7, and 6.6) for the Project.

8.1.7 Minnesota State Historic Preservation Office

In a September 2010 letter, Xcel Energy notified the Minnesota SHPO of the Project and requested comments concerning cultural resources associated with the Project. On October 21, 2010, the SHPO responded via letter that due to the nature of the Project, it recommends that an archaeological survey be completed (*see* **Appendix C.7**).

In response to the SHPO request, Xcel Energy engaged URS to complete a Phase Ia literature review and prepare a Phase Ia Report for the Project. On April 13, 2011, Xcel Energy submitted a consultation letter with a copy of the Phase Ia Report to the SHPO requesting SHPO written agreement with a Phase Ia Report findings for the Project, which recommended that for the majority of the proposed Project no archaeological or historic resources will be affected by construction or operation of the transmission line Project. However, the Phase Ia Report did identify one area of concern at the proposed Orono Substation replacement site. The Phase Ia

2 Note that the MnDOT response refers to the scope of the Environmental Assessment which was going to be prepared in the local review process, before the City referred the Project to the MPUC. *See* Section 8.3.

Report recommended that archaeological field surveys be initiated in areas previously undisturbed prior to construction at the Orono Substation replacement site. On May 12, 2011, the SHPO responded to the April 2011 request and it concurred with the conclusions and recommendations of the Phase Ia Report (*see* **Appendix C.7**). Xcel Energy will continue to work with the Minnesota SHPO to determine the appropriate next steps for the Project.

8.1.8 Metropolitan Council

In a letter dated October 26, 2010, Metropolitan Council indicated that the potential visual and noise impacts to the Baker Park Reserve should be evaluated in the EA. Additionally the Metropolitan Council indicated that the proposed transmission line will cross Council forcemain interceptor 8352 which is a 12-inch outside diameter ductile iron pipe. The Metropolitan Council requested that preliminary plans be sent to Scott Dentz for review and comment prior to construction to assess potential impacts to the interceptor pipe. (*See* **Appendix C.8**).

8.1.9 Three Rivers Park District

The Three Rivers Park District provided three responses to request for comment regarding the Project (October 26, 2010, November 12, 2010, and January 26, 2011) (*see* **Appendix C.9**).

In its October letter the Three Rivers Park District indicated that it appeared no new construction from the Proposed Route will affect the Park District Property.

Comments in the November letter from the Three Rivers Park District related to the evaluation of the Alternative Routes. The Three Rivers Park District indicated that it had concerns with at least one of the Alternative Routes discussed at meeting between the Three Rivers Park District and Xcel Energy on November 1, 2010. Of concern, was that one of the Alternative Routes discussed was proposed to be located within the Baker Park Reserve and that under Minnesota State Statutes the Park District is charged to operate, maintain, protect, improve and preserve the park system. Further the November letter explained that under the State Statute, diversion of Park District property for any purpose other than those for which the lands were acquired will be strongly opposed by the Three Rivers Park District.

In the January letter, the Three Rivers Park District thanked Xcel Energy for informing the District of the proposal to expand and upgrade the Orono Substation and construct the new 115 kV transmission line.

8.2 Identification of Landowners

A list of the nine landowners surrounding the Project location is included in **Appendix D.1**. Addresses have been redacted from the landowner list and comment forms due to privacy concerns.

8.3 Public Participation

In developing the route alternatives, Xcel Energy consulted with local, state, and federal agencies associated with the area with which the Project lies. As discussed in Section 8.1, Xcel Energy provided a notification letter to the Project's LGU on January 10, 2011. Xcel Energy also provided a request for comment letter to various agencies that may have interest in the Project on January 10, 2011. Agencies generally responded with specific environmental or other data (e.g., special status

species, land use maps) and applicable guidelines, rules, and regulations, a summary of which is provided in Section 8.1 above. Xcel Energy will continue to communicate with these agencies throughout the permitting process.

As discussed in Section 4.2.2, Xcel Energy initially sought local review of the Project from the City of Orono. On August 20, 2010, Xcel Energy applied for a CUP from the City pursuant to Minn. Stat. 216E.05, subd. 1(a), and MN Rule 7850.5300 subp. 1. On December 13, 2010, the Orono City Council voted to refer review and permitting of the routing and siting of the Project to the Commission pursuant to Minn. Stat. 216E.05, subd. 1(b), and MN Rule 7850.5300 subp. 4.

The following summarizes the several meetings Xcel Energy has participated in during the route development and initial permitting processes.

- City of Orono Planning Commission meeting on September 20, 2010;
- Meeting with Three Rivers Park District on November 1, 2010;
- City of Orono City Council meeting on December 13, 2010;
- Meetings with surrounding landowners on various dates; and
- Meeting with BNSF on March 17, 2011.

Comments from the public are included in **Appendix D.2**. In general, public comments have been related to the following; a concern that the proposed Project will decrease property values of homes within the HFA, EMF risks, environmental issues and mosquito control. Additionally, many of the HFA home owners commented to the City of Orono on their preference that the City maintain local review of the project and not refer it back to the Commission.

Xcel Energy has been working with the City, various agencies, and landowners to establish an acceptable route that results in the least impacts practicable on current infrastructure, residences, and future development.

On several occasions last winter and spring of 2011 Xcel Energy met or corresponded with the two landowners who own residences where existing Line 0831 crosses their respective properties. The parties discussed options for routing the new proposed 115 kV transmission line that would connect to Line 0831, and the possibility of moving existing Line 0831 from their properties onto adjacent HFA land. At this time, the parties are working toward an agreement to move existing Line 0831 from these properties and re-routing Line 0831 on HFA property which parallels the BNSF railroad right-of-way. Xcel Energy is also working with representatives of HFA concerning this matter.

Xcel Energy also met with the landowner west and adjacent to the existing substation site regarding replacement of the substation, placement of transmission structures, site grading and vegetation. Xcel Energy will continue to work with this landowner.

Xcel Energy also corresponded and met with BNSF representatives concerning placement of the new 115 kV transmission structures and conductors at least five feet from existing BNSF railroad right-of-way. On May 9, 2011, Xcel Energy submitted to BNSF an "Application for Wireline Crossing or Longitudinal" for the proposed transmission line. On June 2, 2011, BNSF approved

the Permit Application for Wireline Crossing or Longitudinal to place the new structures at least five feet from the existing BNSF railroad right-of way.

8.4 Required Permits and Approvals

The following **Table 15** identifies federal, state, and local permits and approvals that could potentially be required for the Project.

Table 15
Potential Required Permits

Jurisdiction and Permit	Requirement
Federal	
USACE, Clean Water Act, Section 404 Permit	Required if dredging and filling activities will occur within jurisdictional wetlands. If the proposed activities are not eligible for coverage under the General Permit or Letter of Permission, an Individual Permit will be obtained from the USACE.
State	
Commission, Route Permit	Required for any transmission line of 100 kV or greater and greater than 1,500 feet in length.
MnDNR, License to Cross Public Lands and Waters	Required if any work is necessary in public waters.
MnDOT, Utility Permit	Required to place utilities on Minnesota trunk highway right-of-way.
MPCA, NPDES/SDS General Stormwater Permit for Construction Activity	Required under the NPDES/SDS General Stormwater Permit for Construction Activity where construction activities will cause more than one acre of ground disturbance.
MPCA, Section 401 Water Quality Certification	Required if the USACE requires an individual permit for wetland dredging and filling activities.

Jurisdiction and Permit	Requirement
Hennepin County	
Culvert Extension/Connection	Required if extending/connecting culverts. (Sometimes also referred to as an Entrance Permit.)
Driveway Permit	Required for any changes proposed to driveway access or driveway widening along county highways, including field driveways, residential driveways, commercial driveways and public street access. (Sometimes also referred to as an Access Permit.)
Moving Permit (Hauling)	Required whenever legal dimensions and/or axle weights are exceeded per county regulations.
Oversize/Overweight Vehicle Permit	Required on all county highways. May be required to move over-width loads on county, township, or city roads.
Utility Permit	Required for work proposed in the county highway rights-of-way. Work requiring this permit includes installation and repair of telephone cables, power lines, gas lines, storm sewers, sanitary sewers, water mains, ditch grading, culvert installation, etc.
Wetland Permit	Required for activities in wetlands, if needed.
Working in the Right-of-Way Permit	Required if constructing on, across, or under the right-of-way of a county highway.

For the other permits listed in **Table 15** above, and any additional permit requirements identified during subsequent agency consultations, Xcel Energy will acquire the necessary authorizations and develop the appropriate plans associated with any permit or authorization (e.g., stormwater pollution prevention management plan prior to construction.

9.0 REFERENCES

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10.0 DEFINITIONS

Following are a list of definitions for technical terms used in this Application:

Avian	Of or relating to birds.
Breaker	Device for opening a circuit.
Bus	An electrical conductor that serves as a common connection for two or more electrical circuits; may be in the form of rigid bars or stranded conductors or cables.
Conductor	A material or object that permits an electric current to flow easily.
Corona	The breakdown or ionization of air in a few centimeters or less immediately surrounding conductors.
Double circuit	The construction of two separate circuits at the same or different voltage on the same structures to increase capacity of the line.
Electric Field ("EF")	The field of force that is produced as a result of a voltage charge on a conductor or antenna.
Electromagnetic	The term describing the relationship between electricity and magnetism; a quality that combines both magnetic and electric properties.
Electromagnetic Field ("EMF")	The combination of an electric (E) field and a magnetic (H) field, such as in high frequency radiating fields. For the lower frequencies associated with power lines, EMF should be separated into electric and magnetic fields. Electric and magnetic fields arise from the flow of electricity and the voltage of a line. The intensity of the electric field is related to the voltage of the line. The intensity of the magnetic field is related to the current flow through the conductors.
Electromotive Force	The force (voltage) that produces an electric current in a circuit.
Excavation	A cavity formed by cutting, digging, or scooping.
Fauna	The collective animals of any place or time that live in mutual association.
Flora	The collective plants of any place or time that live in mutual association.
Grading	To level off to a smooth horizontal or sloping surface.
Grounding	To connect electrically with a ground; to connect some point of an electrical circuit or some item of electrical equipment to earth or to the conducting medium used in lieu thereof.
Habitat	The place or environment where a plant or animal naturally or normally lives and grows.
High Voltage Transmission Lines ("HVTL")	Overhead and underground conducting lines of either copper or aluminum used to transmit electric power over relatively long distances, usually from a central generating station to main substations. They are also used for electric power transmission from one central station to another for load sharing. In Minnesota, a HVTL is a conductor of electric energy and associated facilities designed for and capable of operating at a nominal voltage of 100 kilovolts or more either immediately or without significant modification (associated facilities include, but not be limited to, insulators, towers, substations, and terminals). *See* Minn. Rules 7850.1000, Subp. 9.

Ionization	Removal of an electron from an atom or molecule. The process of producing ions. The electrically charged particles produced by high-energy radiation, such as light or ultraviolet rays, or by the collision of particles during thermal agitation.
Magnetic Field ("MF")	The region in which the magnetic forces created by a permanent magnet or by a current-carrying conductor or coil can be detected. The field that is produced when current flows through a conductor or antenna.
Mitigate	To lessen the severity of or alleviate the effects of.
Neutral to Earth Voltage ("NEV")	The term NEV is used to describe a measurable level of voltage which may occur between a metal object and the adjacent floor or earth.
Oxide	A compound of oxygen with one other more positive element or radical.
Ozone	A form of oxygen in which the molecule is made of three atoms instead of the usual two.
Raptor	A member of the order Falconiformes, which contains the diurnal birds of prey, such as the hawks, harriers, eagles, and falcons.
Sediment	Material deposited by water, wind, or glaciers.
Stray Voltage	A condition that can occur on the electric service entrances to structures from distribution lines, not transmission lines. More precisely, stray voltage is a voltage that exists between the neutral wire of the service entrance and grounded objects in buildings such as barns and milking parlors. Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences. Transmission lines, however, can induce stray voltage on a distribution circuit that is parallel to and immediately under the transmission line.
Substation	A substation is a high voltage electric system facility. It is used to switch generators, equipment, and circuits or lines in and out of a system. It also is used to change AC voltages from one level to another. Some substations are small with little more than a transformer and associated switches. Others are very large with several transformers and dozens of switches and other equipment.
Ultraviolet Radiation	A portion of the electromagnetic spectrum with wavelengths shorter than visible light.
Voltage	Electric potential or potential difference expressed in volts. A unit of electrical pressure, electric potential or potential difference expressed in volts. The term used to signify electrical pressure. Voltage is a force that causes current to flow through an electrical conductor. The voltage of a circuit is the greatest effective difference of potential between any two conductors of the circuit.
Voltage Drop	The difference in voltage between two points; it is the result of the loss of electrical pressure as a current flows through a resistance.
Waterfowl	A bird that frequents water; especially a swimming game bird (as a duck or goose) as distinguished from an upland game bird or shorebird.
Wetland	Wetlands are areas that are periodically or permanently inundated by surface or ground water and support vegetation adapted for life in saturated soil. Wetlands include swamps, marshes, bogs and similar areas.

11.0 ACRONYMS

ACSS	ALUMINUM CORE STEEL SUPPORT
APPLICATION	MINNESOTA PUBLIC UTILITIES COMMISSION ROUTE PERMIT APPLICATION
BMPS	BEST MANAGEMENT PRACTICES
BNSF	BURLINGTON NORTHERN SANTA FE RAILWAY
CEF	CONSIDERED ELIGIBLE FINDING
COMMISSION	MINNESOTA PUBLIC UTILITIES COMMISSION
COMPANY	NORTHERN STATES POWER COMPANY
CON	CERTIFICATE OF NEED
CUP	CONDITIONAL USE PERMIT
DBA	DECIBELS
EA	ENVIRONMENTAL ASSESSMENT
EFS	ELECTRIC FIELDS
ELF	EXTREMELY LOW FREQUENCY
EMF	ELECTROMAGNETIC FIELDS
ECS	ECOLOGICAL CLASSIFICATION SYSTEM
FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY
GP	GENERAL PERMIT
GRE	GREAT RIVER ENERGY
HFA	HUNTINGTON FARMS ASSOCIATION
HVTL	HIGH VOLTAGE TRANSMISSION LINE
ICNIRP	INTERNATIONAL COMMISSION ON NON-IONIZING RADIATION PROTECTION
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
KCMIL	THOUSAND CIRCULAR MIL
KV	KILOVOLT
KV/M	KILOVOLTS PER METER
L	LEVEL DESCRIPTORS
L10	THE DBA THAT MAY BE EXCEEDED 10 PERCENT OF THE TIME WITHIN AN HOUR
L50	THE DBA THAT MAY BE EXCEEDED 50 PERCENT OF THE TIME WITHIN AN HOUR
LEF	LARGE ENERGY FACILITY
LGU	LOCAL GOVERNMENT UNITS
LOP	LETTER OF PERMISSION
MA	MILLIAMPERES
MCWD	MINNEHAHA CREEK WATERSHED DISTRICT
MFS	MAGNETIC FIELDS

MG	MILLIGAUSS
MNDNR	MINNESOTA DEPARTMENT OF NATURAL RESOURCES
MNDOT	MINNESOTA DEPARTMENT OF TRANSPORTATION
MPCA	MINNESOTA POLLUTION CONTROL AGENCY
MPUC	MINNESOTA PUBLIC UTILITIES COMMISSION
NAC	NOISE AREA CLASSIFICATION
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NERC	NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION
NESC	NATIONAL ELECTRIC SAFETY CODE
NEV	NEUTRAL TO EARTH VOLTAGE
NHIS	NATURE HERITAGE INFORMATION SYSTEM
NIEHS	NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES
NPDES	NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
NRHP	NATIONAL REGISTER OF HISTORIC PLACES
NWI	NATIONAL WETLANDS INVENTORY
PEM	PALUSTRINE EMERGENT WETLAND
PEMCD	PALUSTRINE EMERGENT SEASONALLY FLOODED PARTIALLY DRAINED/DITCHED WETLAND
PLS	HISTORIC PUBLIC LAND SURVEY
PPM	PARTS PER MILLION
PPSA	POWER PLANT SITING ACT
PSCW	PUBLIC SERVICE COMMISSION OF WISCONSIN
PWI	PUBLIC WATERS INVENTORY
SHPO	STATE HISTORIC PRESERVATION OFFICE
SWCD	SOIL AND WATER CONSERVATION DISTRICT
SWPPP	STORM WATER POLLUTION PREVENTION PLAN
USACE	U.S. ARMY CORPS OF ENGINEERS
USDA	U.S. DEPARTMENT OF AGRICULTURE
USFS	U.S. FOREST SERVICE
USFWS	U.S. FISH AND WILDLIFE SERVICE
WCA	MINNESOTA WETLAND CONSERVATION ACT
WHO	WORLD HEALTH ORGANIZATION